

**Nonsuicidal Self-Injury and Suicidal Risk: An Examination
among Young Adults**

by

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Abstract

Nonsuicidal self-injury (NSSI), which refers to the direct and deliberate destruction of bodily tissue in the absence of suicidal intent, is a serious and widespread mental health concern. Although NSSI has been differentiated from suicidal behavior on the basis of non-lethal intent, research has shown that these two behaviors commonly co-occur. Despite increased research on the link between NSSI and suicidal behavior, however, little attention has been given as to why these two behaviors are associated. My doctoral dissertation specifically addressed this gap in the literature by examining the link between NSSI and several measures of suicidal risk (e.g., suicidal ideation, suicidal attempts, pain tolerance) among a large sample of young adults. The primary goal of my doctoral research was to identify individuals who engaged in NSSI at risk for suicidal ideation and attempts, in an effort to elucidate the processes through which psychosocial risk, NSSI, and suicidal risk may be associated. Participants were drawn from a larger sample of 1153 undergraduate students (70.3% female) at a mid-sized Canadian University. In study one, I examined whether increases in psychosocial risk and suicidal ideation were associated with changes in NSSI engagement over a one year period. Analyses revealed that beginners, relapsed injurers, and persistent injurers were differentiated from recovered injurers and desisters by increases in psychosocial risk and suicidal ideation over time. In study two, I examined whether several NSSI characteristics (e.g., frequency, number of methods) were associated with suicidal risk using latent class analysis. Three subgroups of individuals were identified: 1) an infrequent NSSI/not high risk for suicidal behavior group, 2) a frequent NSSI/not high risk for suicidal behavior group, and 3) a frequent NSSI/high risk for suicidal behavior group. Follow-up analyses indicated that

individuals in the frequent NSSI/high risk for suicidal behavior group met the clinical cutoff score for high suicidal risk and reported significantly greater levels of suicidal ideation, attempts, and risk for future suicidal behavior as compared to the other two classes. Class 3 was also differentiated by higher levels of psychosocial risk (e.g., depressive symptoms, social anxiety) relative to the other two classes, as well as a comparison group of non-injuring young adults. Finally, in study three, I examined whether NSSI was associated with pain tolerance in a lab-based task, as tolerance to pain has been shown to be a strong predictor of suicidal risk. Individuals who engaged in NSSI to regulate the need to self-punish, tolerated pain longer than individuals who engaged in NSSI but not to self-punish and a non-injuring comparison group. My findings offer new insight into the associations among psychosocial risk, NSSI, and suicidal risk, and can serve to inform intervention efforts aimed at individuals at high risk for suicidal behavior. More specifically, my findings provide clinicians with several NSSI-specific risk factors (e.g., frequent self-injury, self-injuring alone, self-injuring to self-punish) that may serve as important markers of suicidal risk among individuals engaging in NSSI.

Keywords: nonsuicidal self-injury; suicidal behavior; psychosocial risk; young adults

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Chapter 1: Nonsuicidal Self-Injury and Suicidal Risk: An Examination among Young Adults¹

An Overview:

Self-injurious behaviors (SIB) are behaviors that cause direct and deliberate harm to oneself, including nonsuicidal self-injury and suicidal behavior (Nock, 2010; Nock, Joiner, Gordon, Lloyd-Richardson, & Prinstein, 2006). Self-injurious behaviors are serious and widespread mental health concerns, as recent estimates indicate that as many as 13-38% of young adults have engaged in nonsuicidal self-injury (NSSI) such as self-cutting, burning and scratching without lethal intent (Baetens, Claes, Muehlenkamp, Grietens, & Onghena, 2011; Brausch & Gutierrez, 2010; Gratz, Conrad & Roemer, 2002; Heath, Toste, & Beetam, 2007; Heath, Toste, Nedecheva & Charlebois, 2008). Moreover, as many as 4-8% of young adults report having made a prior suicide attempt (Beggington et al., 2010; Whitlock & Knox, 2007), and estimates are even higher among inpatient samples (Claes et al., 2010; Jacobson, Muehlenkamp, Miller & Turner, 2008). Although NSSI and suicidal behavior are both forms of self-injurious behavior, these behaviors have been differentiated on the basis of intention, frequency, and lethality (Guertin, Lloyd-Richardson, Spirito, Donaldson & Boergers, 2001; Muehlenkamp & Gutierrez, 2007). Despite the important differences between NSSI and suicidal behavior, however, recent research suggests that NSSI is an important marker of suicidal risk (see Hamza, Stewart & Willoughby, 2012 for a review). Yet, little attention has been paid to why

¹ A version of this chapter has been published. Hamza, Stewart & Willoughby (2012).

Examining the link between nonsuicidal self-injury and suicidal behavior: A review of the literature and an integrated model. *Clinical Psychology Review*, 32, 482-495.

NSSI may increase risk for suicidal behavior. My doctoral dissertation specifically addressed this gap in the literature by examining the link between NSSI and several measures of suicidal risk among a large sample of young adults. The primary goal of my doctoral research was to identify individuals who engaged in NSSI at high risk for suicidal behavior, in an effort to elucidate the processes through which NSSI, psychosocial risk, and suicidal risk may be associated. As first author on all three of my dissertation studies, I had a leadership role in the development and conceptualization of all of the ideas presented. As first author, I was responsible for data collection, data analysis, and writing up study results for publication. More specifically, as first author I was responsible for writing the first draft of each manuscript. I conducted statistical analyses independently, and in collaboration with my supervisor.

Nonsuicidal Self-Injury (NSSI)

Nonsuicidal self-injury (NSSI) is defined in the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5; American Psychiatric Association, 2013) as the direct and deliberate destruction of bodily tissue in the absence of suicidal intent, and includes behaviors such as self-cutting, burning, hitting and head-banging (Nock & Favazza, 2009). Estimates of prevalence suggest that, among clinical inpatient samples, as many as 21% of adults (Briere & Gil, 1998) and 30 to 40% of adolescents engage in NSSI (Darche, 1990; Jacobson et al., 2008). NSSI is not only a clinical health concern, however, as recent estimates based on community samples indicate that as many as 13 to 38% of adolescents and young adults (Baetens et al., 2011; Brausch & Gutierrez, 2010; Heath, Toste, & Beetam, 2007; Ross & Heath, 2002), and 4-6% of older adults have engaged in NSSI (Briere & Gil, 1998; Klonsky, 2011). Across both clinical and

community-based samples, research has shown that NSSI tends to have its onset in adolescence, and most commonly occurs between the ages of 13 and 15 years (Glenn & Klonsky, 2009; Heath et al., 2008; Nock, 2010; Nock & Prinstein, 2004; Whitlock & Knox, 2007). Although NSSI tends to have its onset in adolescence, recent research suggests that close to 40% of community samples report engaging in NSSI for the first time between the ages of 17 and 24 (Heath et al., 2008; Whitlock, Eckenrode & Silverman, 2006), which has led researchers to conclude that a significant portion of young adults who engage in NSSI will begin to do so during the young adult years (Heath et al., 2008). Thus, researchers have suggested that adolescence and early adulthood may represent periods of increased risk for initiation in NSSI engagement (Heath et al. 2008; Muehlenkamp & Gutierrez, 2007).

Suicidal Thoughts and Behaviors

Suicidal behaviors refer to directly self-injurious behaviors (e.g., suicide attempt, suicide) that are engaged in *with the intent* to end one's life, such as hanging or strangulation, severe cutting, and jumping from heights (Andover & Gibb, 2010; Nock, 2010), whereas suicidal thoughts refer to thinking about or planning to engage in behaviors to end one's life (i.e., suicidal ideation or plan; Nock, 2010; Nock et al., 2008). Among community-based samples, as many as 4-8% of adolescents and adults report having made at least one suicide attempt (Muehlenkamp & Gutierrez, 2007; Nock et al., 2008; Whitlock & Knox, 2007). Estimates are higher among clinical-based samples, with as many as 24-33% of adolescents (Asarnow et al., 2011; Jacobson et al., 2008) and 35-40% of adults reporting a history of suicidal attempts (Claes et al., 2010). It is estimated that the global mortality rate for death by suicide is 14.5/100,000, making suicide the

fourth leading cause of death among individuals ages 15-44 years (Krug, Dahlberg, Mercy, Zwi, & Lozano R, 2002). Suicidal behavior tends to have its onset in late adolescence (Darke, Torok, Kaye & Ross, 2010; Nock et al., 2008) and statistics indicate that adolescents report higher levels of suicidal ideation than any other age group (Nock et al., 2008; Krug et al., 2002). The greatest number of deaths by suicide, however, occurs in late adulthood (Nock et al. 2008; Statistics Canada, 2008; Krug et al., 2002), suggesting that although suicidal behavior may have its onset in adolescence, late adulthood represents the period of greatest risk for death by suicide.

Differentiating Forms of Self-injury

Although NSSI and suicidal behavior are both forms of self-injurious behavior (SIB), NSSI and suicidal behavior have been differentiated in three important ways: intention, repetition, and lethality (Baetens et al. 2011; Guertin et al., 2001; Muehlenkamp & Gutierrez, 2004). The primary distinction between NSSI and suicidal behavior is related to the intention of the individual engaging in the self-injurious behavior (Nock, 2010). Unlike individuals who engage in suicidal behavior, individuals who engage in NSSI do not intend to end their own life, or perceive that death will result from engaging in NSSI behaviors (Andover & Gibb, 2010; Favazza, 1998; Patton et al., 1997). Indeed, research has consistently shown that NSSI primarily serves to regulate and improve negative mood states (e.g., anger, sadness, stress; Armey, Crowther & Miller, 2011; Muehlenkamp et al., 2009; Nock, Prinstein, & Sterba, 2009), and is not regarded by self-injurers as a means to end life. Individuals who engage in NSSI and suicidal behavior, therefore, may be similarly motivated to find relief from distressing affective states (Brown, Comtois & Linehan, 2002), but individuals who engage in suicidal

behavior are differentiated from individuals who engage in NSSI by the desire to end their own life (Muehlenkamp, 2005; Muehlenkamp & Gutierrez, 2004). Consistent with this distinction, adolescents who engage in NSSI can be differentiated from adolescents with a history of suicide attempt by more positive attitudes toward life, and more negative attitudes toward death (Muehlenkamp & Gutierrez, 2004).

Nonsuicidal self-injury and suicidal behavior can be further differentiated in terms of frequency and lethality of behavior (Briere & Gil, 1998; Muehlenkamp, 2005; Muehlenkamp & Gutierrez, 2007). NSSI often involves low lethality methods (e.g., cutting, burning, biting) whereas suicidal behavior tends to involve high lethality methods (e.g., overdose, wrist cutting, hanging; Andover & Gibb, 2010). NSSI also tends to occur more frequently than suicidal behavior, particularly among clinical samples. For example, in a sample of adolescent inpatients engaging in NSSI, the mean number of NSSI incidents in the past year was eighty (Nock & Prinstein, 2004), whereas among adolescent inpatients with at least one prior suicide attempt, the mean number of lifetime suicide attempts was 2.8 (Nock et al., 2006). Similarly, in a sample of adult inpatients, the mean number of lifetime NSSI incidents was 156, and the mean number of suicide attempts was 2.0 (see Andover & Gibb, 2010 for a similar finding with adult inpatients). Among community-based samples, both frequency of NSSI and suicidal attempts are lower than among clinical samples, with estimates suggesting that the vast majority of adolescents and young adults report having made only one prior suicidal attempt (Brausch & Gutierrez, 2010; Muehlenkamp & Gutierrez, 2007; Whitlock & Knox, 2007), and 2-10 incidents of NSSI (Heath et al., 2008; Muehlenkamp & Gutierrez, 2007; Whitlock & Knox, 2007).

Despite the important differences between NSSI and suicidal behavior, however, these two forms of self-injury commonly co-occur among clinical and community-based samples (Jacobson et al., 2008; Nock et al., 2006). For example, in a study of 6-8th graders, 10% of pre-adolescents with a history of NSSI also reported a suicide attempt in the past year (Hilt, Nock, Lloyd-Richardson & Prinstein, 2008). Among outpatient samples of adolescents, 33-37% of adolescents with a history of NSSI also reported having made at least one suicidal attempt at some point in time (Asarnow et al., 2011; Jacobson et al., 2008). A high co-occurrence of NSSI and suicidal attempts also has been observed among younger and older adults. More specifically, of those adults reporting a history of NSSI, 16-25% reported both a history NSSI and suicidal attempt (Bebbington et al., 2010; Kleespies et al., 2011; Wilcox et al., 2012). Given the high co-occurrence of NSSI and suicidal behaviors, researchers have concluded that although NSSI and suicidal behaviors may differ in important ways, these behaviors also are related (Stanley, Gameroff, Michalsen & Mann, 2001).

The Link between NSSI and Suicidal Behavior

Over the past decade, several researchers have suggested that NSSI is a risk factor for suicidal behavior on the basis of research showing that a prior history of self-injury is one of the strongest predictors of suicidal attempts both cross-sectionally and longitudinally (e.g., Boxer, 2010; Chartrand, Sareen, Toews & Bolton, 2012; Corcoran, Reulbach, Perry & Arensman, 2010; Haw, Bergen, Casey & Hawton, 2007; Hawton & Harriss, 2008; McAuliffe, Arensman, Keeley, Corcoran & Fitzgerald, 2007; Sinclair, Hawton & Gray, 2010; for a review, see Portzky & van Heeringen, 2007). Moreover, individuals receiving inpatient care who report prior engagement in self-injury are at

greater risk for death by suicide following or during treatment than individuals without a history of self-injury (Hunt et al., 2007; King, Baldwin, Sinclair & Campbell, 2001; Powell, Geddes, Hawton, Deeks & Goldacre, 2000). Although these studies indicate that past self-injurious behavior may serve as a precursor to suicidal behavior, researchers did not specifically differentiate self-injurious behaviors on the basis of lethal or non-lethal intent. More specifically, both NSSI and suicidal behavior were grouped together as forms of deliberate self-harm. It is unclear from these findings, therefore, whether NSSI specifically increases risk for future suicidal behavior, as NSSI has been confounded with suicidal attempts. Recent research, however, has attempted to address this issue.

Recently several researchers have examined whether NSSI (as explicitly defined on the basis of non-lethal intent) is related to suicidal behavior. Results from these studies have overwhelmingly supported the notion that NSSI is a risk factor for suicidal behavior. Indeed, when we conducted an extensive review of recent literature on NSSI and suicidal behavior (Hamza et al., 2012), we found that consistently across studies NSSI was a robust predictor of suicidal thoughts and behaviors (Andover & Gibb, 2010; Asarnow et al., 2011; Brunner et al., 2007; Darke et al., 2010; Favaro et al., 2008; Lloyd-Richardson, Perrine, Dierker & Kelley, 2007; Nock et al., 2006; Tang et al., 2011; Whitlock, Muehlenkamp, & Eckenrode, 2008; Whitlock & Knox, 2007) and that individuals who engaged in NSSI were significantly more likely to report higher levels of suicidal ideation and to have made a suicidal attempt as compared to individuals who did not engage in NSSI (Claes et al., 2010; Glenn & Klonsky, 2009; Wilcox et al., 2012). It is important to note that the link between NSSI and suicidal behavior was found among clinical and community-based samples (Klonsky, May & Glenn, 2013), and was

maintained after statistically controlling for participant age, gender, ethnicity, and SES (Asarnow et al., 2011; Darke et al., 2010; Tang et al., 2011; Wilkinson, Kelvin, Roberts, Dubicka & Goodyear, 2011). Moreover, NSSI predicted suicidal behavior over and above participant depression (Andover & Gibb, 2010; Asarnow et al., 2011; Tang et al., 2011), hopelessness (Andover & Gibb, 2010; Wilkinson et al., 2011), family functioning (Wilkinson et al., 2011), borderline personality disorder characteristics (Andover & Gibb, 2010), post-traumatic stress, and a history of child abuse (Asarnow et al., 2011; Whitlock et al., 2008). Importantly, these findings suggest that NSSI and suicidal behavior are associated even after taking into account underlying shared risk factors (or third variables; Klonsky et al., 2013).

Recent efforts to disentangle the link between NSSI and suicidal behavior have also included longitudinal examinations of this association. In our review, we identified three studies that examined the predictive value of NSSI on suicidal behavior over time (Asarnow et al., 2011; Prinstein et al., 2008; Wilkinson et al., 2011). More specifically, in two studies involving adolescents receiving treatment for depression, baseline NSSI was predictive of suicidal attempts at 24 and 28 weeks follow-up after controlling for suicidal attempts at baseline (Asarnow et al., 2011; Wilkinson et al., 2011). In both studies a history of suicidal attempts at baseline was not predictive of NSSI at 24 and 28 weeks follow up (Asarnow et al., 2011). In another longitudinal study, Prinstein and colleagues (2008) found that among inpatient adolescents, NSSI frequency at treatment onset was associated with greater concurrent suicidal ideation, as well as lower suicidal ideation remission rates, following treatment. Since publishing our review, two other longitudinal studies have supported the contention that NSSI may be a risk factor for suicidal

behavior. In both of these studies researchers found that baseline NSSI predicted later suicidal ideation and attempts, over and above depressive symptoms, and exposure to early trauma (Guan, Fox, Prinstein, 2013; Whitlock et al., 2013). Taken together, these findings offer compelling evidence that NSSI engagement predicts increased risk for suicidal ideation and attempts over time.

Theoretical Framework

According to Nock's (2010) theoretical model on the development and maintenance of NSSI, high levels of intrapersonal risk (e.g., emotional dysregulation) and interpersonal risk (e.g., conflict with parents or peers), may undermine an individual's ability to cope with distress, which in turn, leads to NSSI engagement as a form of coping behavior. Consistent with Nock's theory, individuals who engage in NSSI report greater intrapersonal (e.g., depressive symptoms, anxiety, emotion dysregulation; Heath et al., 2008; Muehlenkamp, Kerr, Bradley & Larsen, 2010), and interpersonal risk (e.g., lower parental and peer relationship quality; Gratz et al., 2002; Heath, Ross, Toste, Charlebois & Nedcheva, 2009; Hilt et al., 2008; Yates, Tracy & Luthar, 2008) than individuals who do not engage in NSSI. Moreover, researchers have consistently found that regulating aversive emotional and social experiences (e.g., to reduce stress, anxiety, to get others to leave one alone) are two primary motivations underlying NSSI reported by individuals engaging in NSSI (Nock & Prinstein, 2004; Klonsky & Glenn, 2009). An important question to address, therefore, is why a behavior which serves as a form of coping behavior (and is identified specifically on the basis of non-lethal intent), is nevertheless associated with increased suicidal risk (over and above other commonly reported risk factors, including depressive symptoms, hopelessness, family functioning, and PTSD;

Andover & Gibb, 2010; Asarnow et al., 2011; Tang et al., 2011; Wilkinson et al., 2011; Whitlock et al., 2013).

One compelling theory has been proposed to account for why engagement in NSSI may be associated with increased suicidal risk. According to Joiner's Interpersonal Theory of Suicide (2005), in order to end one's own life an individual must have **both** *the desire to end their own life*, as well as the *ability to enact lethal self-injury* (a propensity Joiner refers to as acquired capability for suicide). In his theory, Joiner (2005) conceptualizes suicidal desire as stemming from high levels of psychosocial risk (particularly feelings of social isolation and beliefs about being a burden on others), whereas acquired capability for suicide is regarded as a heightened threshold for self-directed pain, as well as heightened fearlessness about death (Joiner, 2005, Van Orden et al., 2010; Van Orden, Witte, Gordon, Bender & Joiner Jr., 2008). NSSI may be an especially robust predictor of suicidal behavior, therefore, because it is both a marker of psychosocial risk (i.e., which is associated with suicidal desire), as well as a means through which individuals attain the acquired capability for suicide (Joiner, Riberio & Silva, 2012). Joiner suggests NSSI may lead to increased acquired capability for suicide over time through an opponent process. More specifically, the experience of pain during NSSI is proposed to decrease over time, while the affective gains are strengthened (i.e., an opponent response), increasing an individual's tolerance for self-inflicted pain (i.e., a component of acquired capability for suicide). As a result, researchers have recently suggested that NSSI may be a form of "double trouble," when it comes to suicidal risk, because NSSI is associated with both the desire to end one's own life, as well as the ability to end one's own life (Klonsky et al., 2013; Klonsky, Victor, Boaz, & Saffer,

2014) – both of which are essential components for suicidal behavior in Joiner’s theory (Joiner et al., 2012).

Purpose of Doctoral Research

Although Joiner’s (2005) theory provides a strong theoretical rationale for why NSSI and suicidal behavior may be associated, researchers are only beginning to test Joiner’s theory empirically. For my doctoral research, I addressed this significant gap in the literature by conducting three studies on the link between NSSI and several measures of suicidal risk among a large sample of young adults. In study one, I examined associations among several measures of psychosocial risk, suicidal ideation (which is one way Joiner operationalizes suicidal desire), and NSSI engagement. The purpose of study one was to examine whether changes in NSSI engagement over time were associated with changes in psychosocial risk and suicidal ideation over time as proposed by Joiner’s theory (i.e., NSSI is associated with psychosocial risk, which is associated with suicidal ideation). In study two, I examined whether several NSSI characteristics (e.g., frequency, number of methods) were associated with suicidal risk (as predicted by Joiner’s theory that more severe NSSI engagement would lead to greater suicidal risk). I also examined differences among individuals engaging in NSSI on measures of psychosocial risk to determine whether more severe NSSI engagement was more strongly associated with suicidal risk among those experiencing high levels of psychosocial risk (as predicted by Joiner’s theory that individuals require both the desire and ability to enact lethal self-injury). Finally, in study three, I examined whether individuals who engaged in NSSI reported heightened pain thresholds and tolerances relative to individuals who did not engage in NSSI (as predicted by Joiner that NSSI leads to increased acquired capability

for suicide), and extended Joiner's theory by examining variability in pain sensitivity among individuals engaging in NSSI. More specifically, I explored whether individuals who engaged in NSSI to self-punish tolerated pain longer than individuals who engaged in NSSI but not to self-punish.

The overarching goal of my program of research was to provide new insight into the associations among psychosocial risk, NSSI, and suicidal risk. Moreover, another goal of my research was to examine variability among individuals engaging in NSSI on measures of NSSI characteristics (e.g., frequency of engagement, change in engagement over time, motivations for engaging in NSSI) and on measures of psychosocial risk, in an effort to identify individuals engaging in NSSI most at risk for suicidal behavior. Importantly, by identifying those individuals with a history of NSSI at high risk for suicidal behavior, my findings offer new insight into the processes through which NSSI may lead to suicidal behavior over time. On a practical level, my findings can inform clinical care delivery, by allowing more specialized treatment approaches to be developed that directly target individuals at risk for self-injurious behaviors.

Study 1: On the basis of Nock's (2009; 2010) theory on the development of NSSI, it would be expected that increases in psychosocial risk should be associated with NSSI engagement over time. Moreover, change in NSSI engagement and psychosocial risk over time should also coincide with change in suicidal ideation (i.e., a measure of suicidal desire; Joiner, 2005; Van Orden et al., 2008). Despite recent findings that NSSI is associated with psychosocial risk, however, there is a paucity of longitudinal research on NSSI and psychosocial risk over time. Moreover, researchers have yet to examine individual variability among individuals engaging in NSSI over time using a large-scale

longitudinal study. To address this gap in the literature, I used a person-centered approach to study change in NSSI status among individuals engaging in NSSI from first to second year of university. In particular, I examined the prevalence of five patterns of NSSI engagement from first to second year (i.e., beginners, recovered injurers, relapsers, desisters, and persistent injurers), and examined whether these patterns of engagement were associated with changes in psychosocial risk and suicidal ideation over time. Based on Nock and Joiner's theories, I predicted that increases in psychosocial risk would be associated with engagement in NSSI over time (e.g., new onset, relapse, continued engagement), as well as increases in suicidal ideation.

Study 2: According to Joiner's theory (2005), NSSI is associated with suicidal behavior because NSSI increases an individual's ability to enact more lethal forms of self-injury over time (i.e., acquired capacity for suicide). When the ability to end one's own life is coupled with the desire to end one's own life (resulting from high levels of psychosocial risk), individuals are thought to be at high risk for suicidal behavior (Van Orden et al., 2008). On the basis of Joiner's theory, individuals who engage in more frequent NSSI would be expected to be at greater risk for suicidal behavior (i.e., have greater acquired capacity for suicide) than individuals with less frequent NSSI. Moreover, individuals who report high levels of psychosocial risk, in combination with frequent engagement in NSSI, should be at greater risk for suicidal behavior than individuals with frequent NSSI without high levels of psychosocial risk. Despite increasing evidence that NSSI is a risk factor for suicidal behavior, however, researchers have yet to examine whether risk for suicidal behavior varies among individuals engaging in NSSI (i.e., are some self-injurers at greater risk for suicidal behavior than others?). To

address this significant gap in the literature, for my second doctoral study, I examined individual variability in both NSSI and suicidal behavior using latent class analysis. The application of latent class analysis enabled me to examine whether several NSSI characteristics (e.g., frequency, number of methods) were associated with suicidal risk, and whether individuals with varying levels of suicidal risk differed on measures of psychosocial risk (e.g., depressive symptoms, friendship quality). On the basis of Joiner's theory, I expected that individuals who engaged in frequent NSSI, and reported high levels of psychosocial risk, would score the highest on measures of suicidal risk, as compared to individuals who engaged in NSSI infrequently, or reported low levels of psychosocial risk.

Study 3: Finally, in study three, I examined one possible mechanism through which NSSI may lead to increased risk for suicidal behavior. Given that Joiner (2005) has proposed that NSSI may increase an individual's risk for suicidal behavior by desensitizing an individual to pain (i.e., a component of acquired capability for suicide), for my third doctoral study I examined the association between NSSI and tolerance to pain in a lab-based setting. More specifically, I examined whether individuals who engaged in NSSI tolerated pain longer than individuals without a history of NSSI. Given that Joiner suggests NSSI may habituate individuals to self-inflicted pain over time, I predicted that individuals who engaged in NSSI would report greater pain tolerance than individuals without a history of NSSI. To extend Joiner's theory, I also explored variability in pain sensitivity among individuals engaging in NSSI, by testing the novel hypothesis that an individual's motivations for engaging in NSSI may be related to his/her willingness to endure pain. In particular, I examined whether individuals who

engaged in NSSI specifically to regulate the need to self-punish, endured pain longer than individuals who engaged in NSSI but not to self-punish. I predicted that individuals who engaged in NSSI to self-punish would endure pain longer than individuals who engaged in NSSI but not to self-punish.

Conclusions:

In summary, NSSI has been differentiated from suicidal behavior on the basis of non-lethal intent (American Psychiatric Association, 2013), and these two forms of self-injury also differ with respect to frequency and lethality of behavior (Muehlenkamp, 2005). Regardless of the important differences between NSSI and suicidal behavior, however, recent research indicates that NSSI is a robust predictor of suicidal behavior (for a review, see Hamza et al., 2012). More specifically, researchers have found that NSSI predicts future suicidal ideation and attempts, even after taking into account other commonly reported risk factors for suicidal behavior (Guan et al., 2012; Whitlock et al., 2013). Joiner (2005) has proposed that individuals who engage in NSSI may be at increased risk for suicidal behavior because: a) NSSI is a marker of psychosocial risk, which is closely aligned with suicidal desire, and b) NSSI may habituate individual's to more lethal forms of self-injury over time by desensitizing them to the fear and pain associated with suicidal behavior (Joiner et al., 2012). In other words, NSSI is thought to be associated with both the desire to end one's own life, as well as the ability to enact lethal self-injury. Little empirical work, however, has explicitly tested Joiner's hypotheses.

To address this gap in the literature, I conducted three studies on NSSI and measures of suicidal risk among a sample of young adults. In my first study, I explored

whether increases in psychosocial risk and suicidal ideation were associated with NSSI engagement over time among university students. I predicted that increasing psychosocial risk over time would be associated engagement in NSSI over time (e.g, new onset, relapse, continued engagement) and increases in suicidal ideation. In study two, I examined whether individuals at high risk for suicidal behavior could be differentiated from individuals at low risk for suicidal behavior on the basis of NSSI engagement, and on measures of psychosocial risk. I predicted that individuals who engaged in frequent NSSI and reported high levels of psychosocial risk would be at greater suicidal risk than individuals with infrequent NSSI or low psychosocial risk. Finally, in study three I tested whether NSSI was associated with increased tolerance to pain (i.e., a component of acquired capability for suicide) as proposed by Joiner (2005). I also extended Joiner's theory by examining whether individuals who engaged in NSSI to self-punish tolerated pain longer than individuals who engaged in NSSI but not to self-punish. I predicted that individuals who engaged in NSSI to self-punish would report greater pain thresholds and tolerances as compared to individuals who engaged in NSSI but not to self-punish.

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Chapter 2 (Study 1): A longitudinal person-centered examination of nonsuicidal self-injury among university students²

Nonsuicidal self-injury (NSSI), which is defined as self-directed deliberate destruction or alteration of bodily tissue in the absence of suicidal intent (Nock & Favazza, 2009), includes behaviors such as self-cutting, carving, burning and hitting (Heath, Toste, Nedecheva & Charlebois 2008; Klonsky & Glenn, 2009). NSSI is a widely occurring health concern, and recent estimates indicate that as many as 13-38% of young adults report a lifetime history of NSSI (Cawood & Huprich, 2011; Gratz, Conrad, & Roemer, 2002; Klonsky & Glenn, 2009; Klonsky & Olino, 2008; Whitlock, Eckenrode, & Silverman, 2006). Although NSSI tends to have its onset in adolescence, close to 40% of community samples report engaging in NSSI for the first time between the ages of 17 and 24 (Heath et al., 2008; Whitlock et al., 2006), which has led researchers to conclude that a significant portion of young adults who engage in NSSI will begin to do so during the university years (Heath et al., 2008). Moreover, researchers have found that as many as 35-72% of university students with an existing history of NSSI report current (i.e., within the past year) engagement in NSSI (Glenn & Klonsky, 2011; Heath et al., 2009; Klonsky & Olino, 2008; Wilcox et al., 2010). Despite the widespread prevalence of NSSI among young adults, little is known about the development and maintenance of NSSI during the university years (Glenn & Klonsky, 2011). Moreover, researchers have yet to examine whether individuals with varying patterns of NSSI engagement can be

² A version of this chapter has been published. Hamza, C. A., & Willoughby, T. (2014). A longitudinal person-centered examination of nonsuicidal self-injury among university students. *Journal of Youth and Adolescence*, 43, 671-685.

differentiated on the basis of psychosocial risk. Importantly, an examination of the risk factors associated with NSSI onset and recurrent engagement can inform theory about the development and maintenance of NSSI over time (e.g., Nock's model, 2010). A better understanding of the risk factors associated with NSSI cessation, in particular, may provide new insight into the ways prevention and intervention programs can target and deter NSSI engagement (e.g., by promoting effective emotion regulation strategies). To address these significant gaps in the literature, therefore, we conducted a person-centered longitudinal examination of individuals with different patterns of NSSI engagement over time (beginners, recovered injurers, relapsers, desisters and persistent injurers) among a large sample of young adults. Moreover, we examined whether individuals with varying levels of engagement in NSSI from first- to second-year university could be differentiated by changes on several markers of psychosocial risk over time.

The Development and Maintenance of NSSI

According to Nock's (2010) theoretical model of the development and maintenance of NSSI over time, increases in intrapersonal risk factors (i.e., difficulty regulating emotions, depressive symptoms) and interpersonal risk factors (i.e., parent-child conflict) may undermine an individual's ability to cope with distress, and thus lead to NSSI (i.e., which acts as an effective social or affective regulation strategy). Consistent with Nock's model, concurrent studies indicate that young adults who engage in NSSI report significantly greater intrapersonal risk, including higher levels of depression, anxiety, suicidality (Glenn & Klonsky, 2009; Hamza, Stewart & Willoughby, 2012; Kerr & Muehlenkamp, 2010; Whitlock & Knox, 2007; Whitlock, Muehlenkamp, Eckenrode, 2008), problem behavior engagement (Gollust, Eisenberg, & Goldberstein, 2008; Serras,

Saules, & Cranford, 2010), lower self-esteem (Cawood & Huprich, 2011), and greater difficulty regulating their emotions (Heath et al., 2008; Muehlenkamp, Kerr, Bradley & Larsen, 2010), than non-injuring young adults. Moreover, self-injurers report lower levels of peer social support (i.e., emotional support, informal support; Heath et al., 2009) and lower levels of perceived maternal and parental care, as well as greater alienation from parents, than young adults without a history of NSSI (Gratz et al., 2002; Martin et al., 2011). These concurrent findings highlight that high levels of psychosocial risk are associated with NSSI engagement, as predicted by Nock (2010).

Although longitudinal research on NSSI is limited, recently researchers also have started to examine whether psychosocial risk factors are associated with NSSI engagement over time. Findings from longitudinal studies, however, offer conflicting results about which risk factors are associated with changes in NSSI engagement. For example, Jutengren et al. (2011) found that peer victimization predicted increases in NSSI frequency among Swedish adolescents over a one year period, although Helibrón and Prinstein (2010) found no longitudinal effects of peer status, peer victimization or depressive symptoms on adolescent NSSI engagement over time. Negative coping style, depressive symptoms, and less positive interactions with peers also have been associated with increased NSSI engagement over time among adolescents (Hankin & Abela, 2011; Prinstein et al., 2010), but only among female 6th graders in Prinstein and colleagues' study. Although findings on peer associations are mixed, both Yu and Fu (2012) and Yates, Tracy and Luthar (2008) found that perceived problems with parents were associated with greater NSSI frequency over time among adolescents. To our knowledge, there have been only two longitudinal studies of NSSI among young adults. In one study,

Glenn and Klonsky (2011) examined several measures of psychosocial risk among university students [e.g., alcohol use, bulimia, anxiety, depression, Borderline Personality Disorder (BPD), impulsivity] and found that although several of these variables were associated with NSSI concurrently, only BPD characteristics and frequency of NSSI at baseline were associated with increases in NSSI frequency over time. In another study of predictors of NSSI engagement (e.g., sexual orientation, affect dysregulation, suicidal behavior, social support, and family factors), Wilcox and colleagues (2011) identified several longitudinal risk factors of NSSI frequency, including non-heterosexual orientation, affective dysregulation, suicidal ideation, suicidal attempts and parental depression. Interestingly, unlike research involving adolescents (e.g., Heath et al., 2009), Wilcox et al. did not find that social support was associated with lower levels of engagement in NSSI over time. Longitudinal findings on risk factors for NSSI, therefore, offer conflicting results about which risk factors are most strongly associated with changes in NSSI engagement over time, and indicate that risk factors vary among self-injurers (e.g., Prinstein et al., 2010).

Variable- vs Person-centered Approaches

Typically, researchers studying NSSI have relied on the use of variable-centered approaches to examine change in NSSI over time (e.g., on *average* does NSSI engagement change over time?). Variable-centered approaches focus on mean change within a group of individuals, but do not take into account individual heterogeneity in change (i.e., is there variability in change over time among individuals engaging in NSSI?). Previous longitudinal findings on risk factors associated with changes in NSSI engagement over time (i.e., studies that group all self-injurers together) may be mixed,

therefore, because psychosocial risk may vary among individuals with varying patterns of engagement in NSSI over time. For example, individuals who stop self-injuring may differ from individuals who continue self-injuring over time on measures of psychosocial risk. While some researchers have compared individuals who engage in NSSI over time to a comparison group of non-injurers (Hankin and Abela, 2011; Heilbron & Prinstein, 2010; Yates et al. 2008), there has been little attention to differences among self-injurers (e.g., individuals who stop engaging in NSSI over time, individuals who start engaging in NSSI for the first time, individuals who relapse). In fact, there has been only one two-wave exploratory study in which individuals with varying patterns of NSSI engagement over time were compared across measures of psychosocial risk. Using a small sample of young adults with a history of NSSI, Glenn and Klonsky (2011) compared individuals who reported NSSI both at baseline and one year later (i.e., persistent injurers) to a group of individuals who reported NSSI at baseline but not one year later (i.e., desisters). The researchers found that persistent self-injurers reported greater lifetime frequency of NSSI and more methods of NSSI than desisters, although the two groups did not differ across measures of psychosocial risk at baseline. Next, Glenn and Klonsky compared self-injurers with no current engagement in NSSI at Time 1 or Time 2 (i.e., recovered injurers) to a group of self-injurers with no current NSSI at Time 1, but relapsed NSSI at T2 (i.e., relapsers). Relapsers reported more recent NSSI engagement prior to baseline than did the recovered injurers, but the two groups did not differ on measures of psychosocial risk.

Although Glenn and Klonsky's (2011) work provides a preliminary examination of the differences among individuals engaging in different NSSI patterns over time, the

study was limited by the use of small sample sizes (e.g., desisters = $N = 5$; relapsers $N = 9$). Contrary to expectations, groups did not differ on measures of psychosocial risk (e.g., young adults who currently engage in NSSI would be expected to report greater psychosocial risk relative to young adults who no longer engage in NSSI); however, the lack of significant differences among groups may have been a result of low power given the small group sizes. In addition, given the small sample sizes, Glenn and Klonsky could not make all possible comparisons among groups (i.e., how might relapsers differ from desisters?), although such comparisons may provide important information about factors that lead to relapsed NSSI engagement over time (as well as identity factors that differentiate individuals who resume self-injury from individuals who stop self-injury). Importantly, there also was no specific examination of individuals who started self-injuring for the *first* time between Time 1 and Time 2 (i.e., beginners). Given that first year university represents a significant transition, and that research has shown that young adulthood may represent a period of increased risk for NSSI onset (Whitlock et al., 2006), identifying individuals at risk for NSSI onset could provide new insight into the factors that lead to first time engagement in NSSI, and could serve to inform prevention efforts aimed specifically at young adults.

Finally, clinical research has shown that an individual's own willingness to change a behavior is an important predictor of whether or not an individual will continue to engage in that behavior over time (Norcross, Krebs, & Prochaska, 2011; Prochaska, 1983). More specifically, according to theory on the stages of change model, individuals who are committed to stopping a behavior are more likely to actively change behavior patterns as compared to individuals with little or no intent to change (Norcross et al.,

2011). No research, however, has explored whether individuals with varying levels of motivation to stop self-injuring show different patterns of NSSI engagement over time. Importantly, an individual's willingness to change his/her NSSI engagement could be an important target of clinical intervention.

The Present Study

The purpose of the present study was to extend previous research in three important ways. First, despite the widespread prevalence of NSSI among young adults (Cawood & Huprich, 2011; Gratz et al. 2002; Klonsky & Glenn, 2009; Klonsky & Olino, 2008; Whitlock et al., 2006), little is known about the development and maintenance of NSSI during the university years. Although recent concurrent research suggests that early adulthood, in particular, may be a period of increased risk for NSSI onset (Heath et al., 2008; Whitlock et al., 2006), no research has specifically examined the prevalence of new NSSI onset over time among young adults. Critically, determining the prevalence of new NSSI onset can serve to inform prevention and intervention programming efforts. To address this gap in the literature, we specifically examined engagement in NSSI over time among a young adult sample. Second, previous longitudinal research on change over time in NSSI engagement has relied primarily on variable-centered approaches. In the present study, rather than examine mean levels of change in a sample of self-injuring young adults (i.e., variable-centered approach), we examined whether individuals with different patterns of NSSI engagement over time (i.e., person-centered approach) could be differentiated on measures of psychosocial risk. Importantly, we examined all possible patterns of change in NSSI engagement over time (i.e., new onset, continued recovery, relapse, cessation, and continued engagement). On the basis of Nock's model, we

expected that persistent injurers (i.e., individuals who engaged in NSSI at both T1 and T2) would report the highest levels of psychosocial risk as compared to the other groups at both time points (i.e., individuals with high levels of social risk, have greater need for NSSI as a form of coping behavior). We also expected that increased psychosocial risk over time would differentiate beginners, relapsers, and persistent injurers from recovered injurers and desisters (i.e., that changes in risk would be associated with change in NSSI engagement, as predicted by Nock's model). Third, no research has explored whether individuals with varying levels of motivation to stop engaging in NSSI show different patterns of NSSI engagement over time. We specifically addressed this gap in the literature, and predicted that greater motivation to stop self-injury would be associated with the cessation of NSSI behaviors over time.

Method

Participants

The present sample was drawn from a larger sample of 1153 undergraduate students (70.3% female, $M_{age} = 19.11$, $SD = 1.05$) from a mid-sized Canadian university who took part in a two-wave study (assessments were one year apart). The overall retention rate of these students at Time 2 was 72% (if including only students who were still registered at the university at Time 2, the retention rate was 80%). From this larger sample, 439 participants (38%) who reported a history of lifetime NSSI at Time 1, and an additional 27 participants (i.e., an additional 2%) who reported NSSI only at Time 2, were included in the present analysis. We also randomly selected 200 non-injuring participants from the larger sample, who did not differ from NSSI participants on age, sex

and parental education, to act as a comparison group. The final sample for the present study, therefore, consisted of 666 participants (71% female, $M_{age} = 19.15$).

Consistent with the broader demographics for the region (Statistics Canada, 2006), 88% of the participants were born in Canada, and the most common ethnic backgrounds reported other than Canadian were British (19%), Italian (17), French (10%) and German (9%). Data on socioeconomic status indicated mean levels of education for mothers and fathers falling between “some college, university or apprenticeship program” and “completed a college/apprenticeship/ technical diploma.” Furthermore, 15% of respondents lived at home with one or both parents, 9% lived off-campus with roommates, and 76% lived in campus residences. Compared to participants who completed the survey at both Time 1 and Time 2, participants who did not complete the survey at Time 2 were more likely to be male and older in age, $ps < 0.01$. There were no significant differences between participants who completed the survey at Time 1 only and participants who completed the survey at Time 1 and Time 2 on any of the study measures, including the NSSI variables (and self-injurers were as likely as non-injurers to participate in the survey at Time 2).

Procedure

At Time 1, students in first-year university were invited to complete a survey examining adjustment to university, by way of posters, classroom announcements, website posting, and residence visits. Students could participate regardless of academic major, and were given monetary compensation (\$10) or course credit for their participation at Time 1 and monetary compensation (\$20) for their participation at Time 2. At Time 2, the students who participated in the first wave of the project were invited to

participate again, by way of emails, posters, and classroom announcements. Only students who previously completed the study at Time 1 were eligible to participate at Time 2. Despite widespread evidence that asking adolescents and young adults about self-injury does not have any iatrogenic effects (Bjarehed, Pettersson, Wangy-Lundh, Lundh, 2012; Gould et al., 2005; Lewis, Rosenrot & Santor, 2011; Lewis & Santor, 2010; Mathias et al., 2012; Muehlenkamp, Walsh & McDaded, 2010; Reynolds et al. 2006) or lead to increased distress (Gould et al., 2005; Whitlock, Pietrusza & Purington, 2013), to ensure the safety of our participants several precautions were taken in the present study. Our study was approved by the University Research Ethics Board, and participants were informed prior to participating in the study that they would be asked questions related to self-injurious behaviors. The survey was administered by trained research personal, who were specifically trained in handling distressed participants (no participants became distressed during survey administration, however). Moreover, participants were given a full debrief at the end of the survey, and a list of contact information of several available local mental resources (and the contact information of the researchers). Participants also were given the opportunity during the survey to provide their contact information, so that they could be contacted by a mental health professional if they were experiencing any symptoms of distress.

Measures

Demographics. For the purposes of the study we created a basic demographic questionnaire to assess participant age, gender (1 = male and 2 = female), ethnicity, and parental education (one item per parent, averaged for participants reporting on both

parents, $r = .40$, scale of 1= *did not finish high school*) to 6= *professional degree*) were assessed at Time 1.

Nonsuicidal self-injury (NSSI). At Time 1, participants completed the Inventory of Statements about Self-Injury (ISAS, Klonsky & Glenn, 2009) to specifically address whether they had engaged in *direct* forms of self-injury. A list of self-injurious behaviors was provided (e.g., cutting, burning, head banging) and participants were asked to indicate how many times in their lives they had intentionally engaged in each of the behaviors listed, without lethal intent. To create a normalized measure of NSSI frequency, participant responses regarding lifetime frequency of NSSI were collapsed into the following six categories: 1 incident, 2-4 incidents, 5-10 incidents, 11-50 incidents, 51-100 incidents, more than 100 incidents (see Heath et al., 2008 for a similar categorization). At Time 1, participants also were asked to indicate whether, on average, they experienced physical pain while self-injuring, the amount of time that elapsed between the urge to self-injure and the act of NSSI (i.e., 1 = *less than 1 hour* to 6 = *more than 1 day*), whether they self-injured alone, and whether they wanted to stop self-injuring. The ISAS has been shown to have good internal consistency and construct validity in previous research (Klonsky & Glenn, 2009; Klonsky & Olino, 2000). Participants who indicated that they had most recently self-injured within the past year were regarded as current self-injurers at Time 1. At Time 2, participants were asked to indicate their frequency of engagement in NSSI in the past 12 months (i.e., since Time 1) using a 4-point scale of (1 = *I have not self-injured in the past year* to 4 = *often*). Participants who indicated that they engaged in NSSI in the past year were regarded as current self-injurers at Time 2.

Delinquency and Alcohol use. Delinquency was measured at both time points with five items assessing stealing money from parents/roommates, shoplifting, destroying other people's property, impaired driving, or being the passenger in a vehicle with a driver who was impaired. Participants were asked to indicate how often in the past year they had participated in each activity on a 4-point scale from 0 (*never*) to 4 (*more than 5 times*). In addition, participants indicated at both time points the frequency of their alcohol use on an 8-point scale from 1 (*never*) to 8 (*everyday*), as well as the average number of drinks consumed per drinking session on a 6-point scale from 1 (*less than 1 drink*) to 6 (*more than 10 drinks*). Exploratory factor analysis (EFA) using Varimax rotation was used to create variable composites. The EFA indicated that the delinquency and alcohol measures loaded onto one factor at each time point (i.e., factor scores ranged from .84 to .87). A standardized composite measure was created at Time 1 and Time 2, with higher scores indicating greater involvement in delinquency and alcohol use. Cronbach's alpha for this scale at Time 1 was 0.76 and 0.74 at Time 2.

Problems with parents. At both time points participants completed 17 items from the Inventory for Parent and Peer Attachment Scale (e.g., I trust my mother, Armsden & Greenburg, 1987) for both parents using a 4-point scale from 1 (*almost never or never*) to 4 (*almost always or always*). A parental attachment score was calculated by averaging scores from both parents ($r = .48$ at Time 1 & $r = .50$ at Time 2). Participants also completed the Psychological Control Scale (Barber, 1996) at both time points for both parents (i.e., "my father is a person who changes the subject whenever I have something to say") using a 3-point scale from 1 (*not at all like him*) to 4 (*a lot like him*). Scores for both parents were averaged into a parental psychological control score ($r = .40$

at Time 1 & $r = .34$ at Time 2). Finally, participants completed the parental criticism subscale at both time points from the Multidimensional Perfectionism Scale (Frost, Marten, Lahart & Rosenblate, 1990), which included items such as, “My parents never try to understand my mistakes.” Participants responded using a 3-point scale from 1 (*strongly disagree*) to 4 (*strongly agree*). The three parenting measures showed acceptable reliability at both Time 1 and Time 2 (Cronbachs = .82 - .91). Exploratory factors analyses indicated that the three parenting measures loaded onto one factor at each time point (i.e., factor scores ranged from .80 to .83), so parenting measures were combined into a standardized composite score at Time 1 and Time 2, with higher scores indicating greater problems with parents.

Internalizing behaviors. Four aspects of internalizing behaviors were assessed at both time points, including depressive symptoms, self-esteem, emotional reactivity and social anxiety. Depressive symptoms were measured using the Center for Epidemiological Studies Depressive symptoms Scale (CES-D, Radloff, 1977), which required participants to indicate how often they experienced 20 depressive symptoms (e.g., felt sad) on a 5-point scale from 1 (*none of the time*) to 5 (*most of the time*). Emotional reactivity was assessed using 13 items from the Emotion Reactivity Scale (e.g., I get angry at people very easily; Nock, Wedig, Holmberg & Hooley, 2008), which required participants to indicate on a 5-point scale the extent to which each statement was 1 (not at all like me) to 5 (completely like me). Self-esteem was assessed using Rosenberg’s (1965) 10-item scale, and required participants to indicate the extent to which they agreed or disagreed to items such as “I take a positive attitude toward myself” using a 5-point scale from 1 (*strongly disagree*) to 5 (*strongly agree*). Finally, social

anxiety was assessed using 14 items (e.g., I feel shy around people my age that I do not know) from The Social Anxiety Scale for Children-Revised (SASC-R, La Greca & Stone, 1993). Participants responded using a 4-point scale from 1 (*almost never or never*) to 4 (*almost always or always*). All four measures of internalizing behaviors demonstrated acceptable inter-item reliability at Time 1 and Time 2 (Cronbachs = .90 - .93), and loaded onto one factor at each time point (factor scores ranged from .71 to .76). Thus, a standardized composite score of internalizing behaviors was created at each time point, with higher scores indicating greater internalizing behaviors.

Suicidal ideation. Participants completed two items from the Suicide Behaviors Questionnaire-Revised (SBQR; Osman et al., 2002) at both time points. First, participants indicated: (1) their frequency of suicidal ideation over the past 12 months (i.e., past year suicidal ideation) on a scale from 1 (*never*) to 5 (*very often*), and (2) their likelihood of a future suicidal attempt (i.e., future suicidal behaviour) from 1 (*never*) to 7 (*very likely*). The two measures were combined into a composite measure of suicidal ideation (i.e., factor scores .75 and .78). The SBQR has been shown to have good internal consistency and validity in previous research (Osman et al., 2002). Cronbach's alpha at Time 1 was .73 and Time 2 was .79.

Problems with peers. Friendship quality was assessed at both time points using 18 items (e.g., My friends accept me as I am) from Armsden and Greenberg's (1987) Parent and Peer Attachment Scale. Participants used a 4-point scale of 1 (*almost never or never*) to 4 (*almost always or always*) to indicate the extent to which each statement applied to them. The Cronbach's alpha was .89 at Time 1 and .91 at Time 2.

Missing Data

Missing data occurred within each assessment time point because some students did not finish the entire questionnaire (5% of data at Time 1 and 2% at Time 2). Missing data also occurred at Time 2 due to attrition (i.e., students who were no longer registered could not be reached due to outdated contact information, or participants chose not to participate again at Time 2). As missing data were not dependent on the values of the study measures, it is reasonable to assume that these data are missing at random (Schafer & Graham, 2002). Missing values were imputed using the EM (expectation-maximum) algorithm. EM is an iterative maximum-likelihood (ML) procedure in which a cycle of calculating means and covariances followed by data imputation is repeated until a stable set of estimated missing values is reached. Methodological research has demonstrated that ML estimation is preferable to pair-wise deletion, list-wise deletion, or means substitution (Schafer & Graham, 2002).

Plan of Analysis

Participants who indicated on the ISAS that they had engaged in NSSI were divided first into different groups depending on their engagement in NSSI (e.g., beginners, recovered injurers, relapsers, desisters, and persistent injurers). Group differences in NSSI characteristics at Time 1 then were assessed using ANOVAs and follow up analyses. Next, groups were compared on several markers of psychosocial risk at Time 1 and Time 2, again using ANOVA and follow up analyses. Given the use of multiple ANOVAS, a Bonferroni correction was applied and a reduced alpha of 0.003 was used to determine significance. Finally, to examine whether change in psychosocial risk over time was associated with NSSI group membership, we conducted a Discriminant Function Analysis (DFA).

Results

Preliminary Analyses

Among self-injuring participants at Time 1, 5.9% of participants had engaged in NSSI once, 15.8% engaged in the behavior 2-4 times, 24% engaged in the behavior 5-10 times, 33.0% engaged in the behavior 11-50 times, 7.1% engaged in the behavior 51-100 times and 14.2% engaged in the behavior more than 100 times. The most commonly endorsed types of self-injury were pinching (24%), self-hitting and head banging (21.9%), and cutting (12.1%). Variable means and standard deviations are presented in Table 2-1.

Primary Analyses

Participants who endorsed having a **lifetime history** of NSSI at Time 1 (i.e., had engaged in NSSI at some point in their lives) were further subdivided based on their current engagement in NSSI (i.e., past year engagement at Time 1 and Time 2; see Table 2-2). The first group (N = 195) had not engaged in NSSI within the past year at Time 1 or within the past year at Time 2 (i.e., recovered injurers). A second group of participants (N = 47) had not engaged in NSSI within the past year at Time 1, but did report engagement in NSSI within the past year at Time 2 (i.e., relapsers). A third group (N = 134) reported engagement in NSSI within the past year at Time 2 (i.e., relapsers). A third group (N = 134) reported engagement in NSSI within the past year at Time 1 but had not engaged in NSSI within the past year at Time 2 (i.e., desisters). The fourth group (N = 69) reported engagement in NSSI within the past year both at Time 1 and at Time 2 (i.e., persistent injurers). In addition to those participants who reported a lifetime history of NSSI at Time 1, there were also 27 participants who reported first time engagement in NSSI at Time 2 (i.e.,

beginners). We also randomly selected a comparison group of non-injuring participants ($N = 200$) from the larger sample.

Group differences at Time 1 and Time 2

First we examined whether the four NSSI groups that reported a lifetime history of NSSI at Time 1 (i.e., recovered injurers, relapsers, desisters, persistent injurers) differed on NSSI characteristics at Time 1 (i.e., lifetime frequency, pain during NSSI, time elapsed between urge and act, whether they were alone during NSSI, and desire to stop self-injuring). The beginners were excluded from this analysis, because they did not report on NSSI characteristics at Time 1 (since they had not yet started self-injuring). Results of the ANOVA analyses indicated that the assumption of homogeneity of variance was violated for some comparisons, so the Welch significance test is presented for those ANOVA results. There were significant differences among groups in NSSI frequency at Time 1, $F(3, 435) = 36.36, p < 0.001$ and desire to stop self-injuring, Welch's $F(3, 128.24) = 8.02, p < 0.001$. Follow-up analyses indicated that recovered injurers and relapsers reported significantly lower frequency of lifetime engagement in NSSI at Time 1 than desisters and persistent injurers (see Table 2-3). Recovered injurers and desisters also reported significantly greater desire to stop self-injuring at Time 1 compared to persistent injurers.

We then examined whether the five NSSI groups (i.e., beginners, recovered injurers, relapsers, desisters, persistent injurers), as well as the comparison group of non-injuring participants, significantly differed at Time 1 and at Time 2 on several measures of psychosocial risk (i.e., delinquency and alcohol use, problems with parents, internalizing behaviors, suicidal ideation, and problems with peers). Results of the

ANOVA analyses indicated that the assumption of homogeneity of variance was violated for some comparisons, so the Welch significance test is presented for those ANOVA results. Results indicated that at both time periods, there were significant group differences in problems with parents at Time 1 and Time 2, $F(5, 660) = 6.496, p < 0.001$ and $F(5, 660) = 7.499, p < 0.001$, internalizing behaviors at Time 1 and Time 2, $F(5, 660) = 12.487, p < 0.001$ and $F(5, 660) = 15.843, p < 0.001$, suicidal ideation at Time 1 and Time 2, Welch's $F(5, 139.79) = 18.36, p < 0.001$ and Welch's $F(5, 136.961) = 21.323, p < 0.001$, and problem with peers at Time 1 and Time 2, $F(5, 660) = 6.677, p < 0.001$ and $F(5, 660) = 4.856, p < 0.001$. Significant follow-up comparisons among groups at Time 1 and Time 2 are presented in Table 2-4 and group means on all measures of psychosocial risk are depicted in Figure 2-1.

At Time 1, individuals in the persistent group (i.e., current NSSI at Time 1 and Time 2) were at highest risk relative to the other groups. Persistent injurers reported significantly greater problems with parents than the beginners and non-injurers and significantly greater internalizing behaviors than the other groups (except for the desisters). Persistent injurers reported significantly greater suicidal ideation than all the other groups, and more problems with peers than relapsers and non-injurers. Although the other NSSI groups did not differ from each other across many measures of psychosocial risk, the desisters reported significantly greater internalizing behaviors than the relapsers and non-injurers. The beginners, recovered injurers, and desisters also reported greater suicidal ideation than the non-injurers.

At Time 2, the persistent injurers were still at greater risk relative to the other groups. Persistent injurers reported significantly more problems with parents than the

recovered injurers and non-injurers, greater internalizing behaviors and suicidal ideation than all the other groups, and more problems with peers than the non-injurers. Individuals in the desisters group also reported greater internalizing behaviors and suicidal ideation than non-injurers, and relapsers reported greater suicidal ideation than recovered injurers and non-injurers. Beginners reported greater suicidal ideation than recovered-injurers and non-injurers, and beginners also reported significantly greater problems with parents, internalizing behaviors, and problems with peers than the non-injurers.

Discriminating groups by change in psychosocial risk

To examine whether change over time in each of the measures of psychosocial risk discriminated among the five self-injury groups (i.e., beginners, recovered injurers, relapsers, desisters, persistent injurers) and the comparison group of non-injurers, we conducted a discriminant function analysis. Standardized residual change scores for each the five measures of psychosocial risk (i.e., delinquency and alcohol use, problems with parents, internalizing behaviors, suicidal ideation, and problems with peers) were simultaneously entered into a discriminant function analysis (DFA) as predictors to determine which risk factors *best discriminated* among the six groups (see Tabachnick & Fidell, 2007). Unlike the univariate analyses, DFA provides an estimate of the relative importance of change in each of the risk factors to the separation among the groups when examined simultaneously (Meyers, Gamst & Guarino, 2003). The relative importance of each measure to the discriminant function was indexed using the standardized canonical discriminant function coefficients. Given that equality of variance among groups could not be assumed for all predictors, the DFA was classified using separate covariance matrixes.

One significant discriminant function was identified, Wilk's $\lambda = .865$, $p < 0.001$, explaining 81% of the separation among groups. An examination of the discriminant function means (i.e., centroids) for persistent injurers, beginners, relapsers, desisters, recovered injurers, and non-injurers (.800, .597, .483, -.057, -.179, -.241) indicated that the function best discriminated the persistent injurers, beginners, and relapsers from the other groups. The measures making notable, unique contributions to the discriminant function when controlling for the other measures entered into the analysis (i.e., standardized discriminant function coefficients of .10 or greater) included increased suicidal ideation (.67), increased internalizing behaviors (.36), increased delinquency and alcohol use (.42), and increased problems with parents (.13; see Figures 2-2a,b,c,d).

Discussion

Despite the widespread prevalence of NSSI among young adults (Cawood & Huprich, 2011; Gratz et al. 2002; Klonsky & Glenn, 2009; Whitlock et al. 2006), little is known about the development and maintenance of NSSI during the young adult years. Moreover, researchers have yet to examine whether individuals with varying patterns of NSSI engagement can be differentiated on the basis of psychosocial risk. Longitudinal examinations of NSSI also have been largely variable-centered, and thus do not take into account individual variability in NSSI engagement among self-injurers. Importantly, identifying individuals at risk for NSSI onset and continued engagement may provide invaluable insight into the factors that promote NSSI engagement over time, as well as inform intervention and prevention programming aimed at targeting individuals most at risk for NSSI. To address these important gaps in the literature, we conducted a person-centered examination of individuals with different patterns of NSSI engagement over

time (i.e., beginners, recovered injurers, relapsers, desisters, and persistent injurers). We found that 46% of self-injurers reported current engagement in NSSI in first year university, which is consistent with studies that find that many undergraduates report current (i.e., past year) engagement in NSSI (Glenn & Klonsky, 2011; Heath et al., 2009; Klonsky & Olino, 2008; Whitlock et al., 2006; Wilcox et al., 2011). Although most self-injurers showed decreased NSSI engagement one year later (i.e., recovered injurers, desisters), many self-injurers continued to engage in NSSI (i.e., persistent injurers) and some self-injurers started self-injuring for the first time, or again (i.e., beginners and relapsers). Our findings highlight that NSSI is a transiently occurring behavior, and that the transition from first- to second-year university is associated with both NSSI engagement (i.e., beginners, relapsers, persistent injurers) and cessation (i.e., recovered injurers, desisters).

According to Nock's (2010) model of the development and maintenance of NSSI, increases in psychosocial risk over time may undermine an individual's ability to cope with distress, and thus lead to NSSI (i.e., a form of coping behavior). In the present study, we examined whether individuals with different patterns of NSSI engagement could be differentiated on measures of psychosocial risk at Time 1 and Time 2, as well as change in psychosocial risk from Time 1 to Time 2. Consistent with Nock's model, we found that individuals who engaged in NSSI in first- and second-year university (i.e., persistent injurers), reported significantly higher levels of internalizing behaviors (e.g., depressive symptoms, emotional reactivity) and greater suicidal ideation than the other self-injuring groups. As predicted, these individuals not only reported greater psychosocial risk at both time points, but the discriminant function analysis revealed that these individuals also

were discriminated from the comparison group of recovered injurers, desisters, and non-injurers by increases in delinquency and alcohol use, problems with parents, internalizing behaviors, and suicidal ideation over time. Individuals who engage in NSSI in both first- and second- year of university, therefore, may be at increased psychosocial risk more generally, and may be a high risk group that is especially important for clinicians to identify.

Another important gap in the literature on change in NSSI engagement over time is that researchers have yet to examine first time NSSI onset among young adults, using a longitudinal study design. To address this gap in the literature, we examined the prevalence of new NSSI onset from first- to second-year university, as well as the risk factors associated with first time engagement in NSSI. Over the one year period, only 27 young adults started engaging in NSSI for the first time (i.e., beginners). Although no previous research has examined NSSI onset over time among young adults, previous studies relying on concurrent retrospective self-report data indicates that close to 40% of self-injurers begin self-injuring between the ages of 17-24 (Heath et al., 2008; Whitlock et al., 2006). Our findings reveal that most young adults in university, however, likely have their onset of NSSI in late adolescence, rather than early adulthood, because we found that very few young adults reported new NSSI onset from first- to second-year university. Although beginners reported similar levels of psychosocial risk as compared to the comparison group of non-injurers at baseline, one year later the beginners reported significantly greater problems with parents, internalizing behaviors, suicidal ideation, and problems with peers than the non-injuring young adults. New onset NSSI in university,

therefore, seems to coincide with increased psychosocial risk over time, as predicted by Nock's model on the development and maintenance of NSSI.

The results of our study also underscore the importance of assessing recency of NSSI engagement among young adults. More specifically, at Time 1 recovered injurers (i.e., individuals with a lifetime history of NSSI who had not engaged in NSSI within the past year at Time 1 or Time 2, $N = 195$) reported higher suicidal ideation than the non-injuring group, although the two groups did not differ on other measures of psychosocial risk. Interestingly, at Time 2, the recovered injurers did not differ from the non-injurers on any of the measures of psychosocial risk, including suicidal ideation. In contrast, young adults who stopped self-injuring from Time 1 to Time 2 (i.e., desisters) still reported greater internalizing behaviors and suicidal ideation than the comparison group of non-injurers at Time 2. In several studies on NSSI, researchers have grouped together individuals who report lifetime histories of NSSI, regardless of most recent NSSI episode (Cawood & Huprich, 2011; Heath et al., 2009; Kerr & Muehlenkamp, 2010). Our results indicate that there are differences in psychosocial risk among self-injurers depending on most recent engagement in NSSI. Future research on NSSI, therefore, should take into account individual variability among self-injurers in NSSI recovery status, as individuals with longer remission periods may be at lower risk than individuals who report more recent engagement. In particular, and of critical importance to clinicians, our results indicate that more recent engagement in NSSI is associated with greater risk of suicidal ideation.

Overall, consistent with Nock's model, we found that change in psychosocial risk over time largely differentiated amongst our self-injuring groups. More specifically, the

discriminant function analysis revealed that beginners, relapsers, and persistent injurers were differentiated from recovered injurers and desisters by increases over time in delinquency and alcohol use, problems with parents, internalizing behaviors, and suicidal ideation. The finding that increased psychosocial risk was associated with NSSI onset and continued engagement in NSSI is consistent with a larger body of literature that has shown that problem behavior engagement (Gollust et al., 2008; Serras et al. 2010), depression and anxiety (Hankin & Abela, Kerr & Muehlenkamp, 2010), suicidality (Hamza, Stewart & Willoughby, 2012; Whitlock & Knox, 2007), difficulty regulating emotions (Heath et al., 2008; Muehlenkamp et al., 2010), and problems with parents and peers (Gratz et al., 2002; Heath et al., 2009; Yates et al., 2008) are associated with NSSI engagement among young adults.

Our results also highlight that differentiating between intrapersonal and interpersonal risk factors for NSSI engagement may be useful when trying to identify individuals most at risk. Given that research has shown that NSSI is a way for individuals to regulate intrapersonal functions (i.e., to reduce stress, anxiety) and interpersonal functions (i.e., to elicit help from others; Klonsky & Glenn, 2009; Nock & Prinstein, 2004), it is not surprising that individuals who experience increases in psychosocial risk over time show increased risk for NSSI onset, as NSSI may serve as a form of coping behavior (Nock, 2010). Importantly, we found that intrapersonal factors (i.e., internalizing behaviors, suicidal ideation) were more strongly associated with NSSI engagement than interpersonal factors (i.e., problems with parents and peers), which is consistent with a broader literature that has found that individuals who engage in NSSI do so primarily for intrapersonal functions (Klonsky & Glenn, 2009). Moreover, recent

research indicates that individuals who engage in NSSI for intrapersonal reasons may be at greater risk for suicidal behavior as compared to individuals who engage in NSSI for interpersonal reasons (Klonsky & Olino, 2008; Nock & Prinstein, 2005). Our results indicated that individuals who engage in NSSI for intrapersonal functions, who report high levels of internalizing behaviors (i.e., depressive symptoms, high emotional reactivity), therefore, may be especially important for clinicians to identify as these individuals may be at risk for continued NSSI engagement and suicidal behaviors.

Despite increased consensus among researchers that NSSI and suicidal behaviors are differentiated with respect to intention, frequency and lethality of behavior (Baetens et al. 2011; Guertin et al., 2001; Hamza & Willoughby, 2012; Muehlenkamp & Gutierrez, 2004; Whitlock & Knox, 2007), the results of our study indicate that NSSI and suicidal ideation are associated among young adults over time. More specifically, increases in suicidal ideation over time differentiated beginners, relapsers, and persistent injurers from the other groups (i.e., recovered injurers and desisters). Interestingly, individuals with a lifetime history of NSSI who were not currently self-injuring at Time 1, but had started self-injuring again at Time 2 (i.e., relapsers) reported higher levels of suicidal ideation than the non-injurers at Time 2, but not at Time 1. This finding is consistent with a larger literature that engagement in NSSI may lead to increased suicidal risk (Asarnow et al., 2011; Prinstein et al., 2008; Wilkinson et al., 2011). It is also noteworthy, however, that beginners (i.e., individuals who had not yet started self-injuring at Time 1, but who started over the one year period) reported greater suicidal ideation than the non-injurers at Time 1 and Time 2. This finding indicates that suicidal ideation (i.e., thinking about ending one's own life) may have preceded the development of NSSI among a minority of

our sample (i.e., beginners). Indeed, NSSI may serve as a way to prevent or inhibit the desire to engage in more lethal forms of self-injury (Nixon et al., 2002; Laye-Gindhu & Schonert-Reichl, 2005), which Klonsky (2007) has referred to as an anti-suicide function of NSSI. Clinicians may want to assess past year suicidal ideation, therefore, to identify individuals who may be at increased risk for first time NSSI engagement. Future research should also examine the developmental timelines of NSSI onset, suicidal ideation, and suicidal behavior to better understand associations among these self-injurious thoughts and behaviors, with varying intents.

According to the theory on the stages of change model, an individual's own willingness to terminate a behavior is an important determinant of behavior engagement (Norcross, Krebs, & Prochaska, 2011; Prochaska, 1983). No previous research, however, has explored whether an individual's desire to stop self-injuring is associated with their NSSI engagement over time. To address this gap in the literature we examined whether self-injurers varied on self-reported willingness to stop engaging in NSSI. Although individuals who engaged in past year NSSI at Time 1 (i.e., both the desisters and persistent groups) reported greater lifetime frequencies of NSSI than the other self-injuring groups, individuals who stopped self-injuring over the one year period (i.e., the desisters) reported significantly greater desire to stop self-injuring than individuals who continued to engage in NSSI over the one year period (i.e., persistent injurers). Unlike Glenn and Klonsky (2011), therefore, we did not find a difference between persistent injurers and desisters in NSSI frequency; however, their study was limited by a small sample size. Moreover, Glenn and Klonsky did not assess motivation to stop self-injuring, which we found to be an important discriminator between persistent injurers and

desisters. An important goal for NSSI intervention efforts, therefore, should be to target motivation to stop self-injuring among self-injurers.

Limitations

Despite the many strengths of our study, including the use of a large sample, the use of a longitudinal design, and our assessment of associations among change in psychosocial risk and NSSI engagement, our study is not without limitations. First, although our study specifically examines longitudinal patterns of NSSI over time, we did not specifically test bidirectional associations between NSSI and psychosocial risk factors. Although we tested whether psychosocial risk factors were associated with different patterns of NSSI engagement over time (e.g., relapse, recovery) it may be that the observed effects are bidirectional and that NSSI engagement also predicts change in psychosocial risk over time. Nevertheless, our findings provide clinicians with several measures of psychosocial risk that can be used to discriminate self-injurers at high risk for current and future engagement in NSSI. Future research could specifically test whether interventions aimed at reducing psychosocial risk factors indirectly reduce NSSI engagement.

Second, although the present sample included a large sample representative of a particular university in Canada, the majority of the participants enrolled in the study were Caucasian and born in Canada; therefore, our findings may not generalize to other geographic regions, including those with differing ethnic and/or demographic backgrounds. Furthermore, our study specifically sampled first-year university students and may not be generalizable to the wider student population (i.e., upper year students) or young adults not attending university. Regardless, research has shown that first year

university may represent a period of increased NSSI initiation as well as increased risk for suicidal ideation (Heath et al., 2008; Whitlock et al., 2008), so understanding risk for NSSI and suicidal behavior during this time period is important to clinicians in the areas of risk assessment and intervention.

Third, another limitation of the present study was the reliance on a single source of information (i.e., self-reports). The study would have benefited from corroboration by other sources (i.e., parents, peers, etc.) at multiple assessment periods. Moreover, our study required participants to recall their lifetime engagement in NSSI. Thus, it is possible that our study is subject to recall errors. To address this limitation, in addition to assessing lifetime NSSI, we incorporated assessments of more recent self-injurious behavior engagement, as well as past year suicidal ideation. Regardless, it would be useful for future research to assess frequency of NSSI behavior in real time using ecological moments sampling, such as the use of daily diaries. Reporting on multiple incidents of NSSI and behaviors also would provide an opportunity to assess the characteristics of multiple episodes of self-injurious behaviors.

Conclusions

NSSI appears to be a widely occurring behavior among young adults (Glenn & Klonsky, 2011; Heath et al., 2009; Klonsky & Olino, 2008; Wilcox et al., 2010), yet little research has examined the development and maintenance of NSSI over time during this age period. Moreover, researchers have yet to examine whether individuals with varying patterns of NSSI engagement can be differentiated on the basis of psychosocial risk, but identifying individuals at risk for NSSI onset and continued engagement has critical implications for prevention and intervention efforts. To address these gaps in the

literature, we conducted a person-centered longitudinal examination of varying patterns of NSSI engagement (i.e., new engagement over time, continued recovery over time, relapse, continuation over time, and cessation) among a large sample of young adults. Overall, we found that many students reported current engagement in NSSI in first year university, though the majority of these individuals stopped self-injuring one year later. Self-injurers who reported persistent engagement in NSSI at Time 1 and Time 2 reported the highest levels of psychosocial risk relative to the other groups, particularly the comparison group of non-injurers. Importantly, we also found that first time engagement, relapsed injuring, and persistent injuring among university students coincided with increases in delinquency and alcohol use, problems with parents, internalizing behaviors, and suicidal ideation. Finally, individuals who stopped engaging in NSSI from Time 1 to Time 2 also reported significantly greater motivation to stop self-injuring as compared to individuals who persisted, highlighting the role of individual motivation in the cessation of NSSI. Our findings indicate that change in psychosocial risk factors over time, as well as desire to stop self-injuring, are important factors to consider when determining risk for future NSSI engagement among self-injurers.

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Table 2-1

Means and standard deviations for study measures

Measure	No NSSI M,SD		Beginners M,SD		Recovered M,SD	
Demographics	T1	T2	T1	T2	T1	T2
Age	19.18(1.18)	-	18.91(.55)	-	19.23(1.09)	-
Sex	1.74 (0.45)	-	1.56(0.48)	-	1.78(0.42)	-
SES	3.66(1.25)	-	4.08(1.04)	-	3.70(1.24)	-
Delinquency and alcohol use						
Delinquency	1.35(0.51)	1.28(0.41)	1.34(0.54)	1.40(0.63)	1.46(0.53)	1.39(0.45)
Alcohol frequency	3.61(1.48)	3.61(1.30)	3.63(1.79)	3.70(1.61)	3.80(1.67)	3.71(1.36)
Alcohol drinks	3.81(1.39)	3.84(1.19)	3.55(1.49)	4.15(1.23)	3.85(1.25)	3.88(1.14)
Problems with parents	2.95(0.43)	2.97(0.38)	2.68(0.45)	2.70(0.49)	2.84(0.44)	2.84(0.42)
Parental relationship	1.42(0.34)	1.39(0.31)	1.55(0.38)	1.56(0.40)	1.51(0.36)	1.47(0.31)
Psychological control	1.98(0.73)	2.05(0.61)	2.26(0.79)	2.25(0.73)	2.11(0.73)	2.10(0.61)
Parental criticism						
Internalizing behaviors						
Depression	2.00(0.60)	1.93(0.56)	2.26(0.61)	2.27(0.78)	2.22(0.66)	2.15(0.61)
Emotional reactivity	2.07(0.77)	2.06(0.68)	2.32(0.74)	2.52(0.79)	2.28(0.79)	2.25(0.68)
Self-esteem	3.93(0.68)	3.90(0.64)	3.68(0.60)	3.74(0.68)	3.77(0.68)	3.78(0.64)
Social anxiety	1.65(0.51)	1.62(0.43)	1.87(0.39)	1.85(0.31)	1.76(0.57)	1.77(0.47)
Suicidal ideation						
Past year ideation	1.12(0.38)	1.15(0.41)	1.58(0.76)	1.85(1.29)	1.38(0.86)	1.40(0.73)
Future attempt	1.19(0.57)	1.19(0.45)	1.52(0.86)	1.74(1.09)	1.59(1.00)	1.36(0.67)
Problems with peers	3.30(0.46)	3.25(0.47)	3.12(0.46)	2.97(0.67)	3.17(0.51)	3.13(0.50)

Note. Higher scores indicate greater delinquency, greater alcohol frequency, greater number of drinks, greater parental relationship quality, greater psychological control, greater parental criticism, greater depression, greater emotional reactivity, greater self-esteem, greater social anxiety, greater past year ideation, greater likelihood of future attempt, and greater friendship quality.

Table 2-1 Continued

Measure	Relapsers M,SD		Desisters M,SD		Persistent M,SD	
	T1	T2	T1	T2	T1	T2
Demographics		-		-		-
Age	19.17(1.01)	-	19.16(1.04)	-	18.91(.79)	-
Sex	1.52 (0.50)	-	1.700(.46)	-	1.63(0.49)	-
SES	3.46(1.06)		3.61(1.19)		3.36(1.38)	
Delinquency and alcohol use						
Delinquency	1.62(0.73)	1.53(0.52)	1.53(0.59)	1.40(0.43)	1.54(0.51)	1.59(0.57)
Alcohol frequency	3.56(1.40)	3.73(1.53)	3.65(1.59)	3.71(1.32)	3.59(1.74)	3.74(1.66)
Alcohol drinks	4.01(1.63)	4.05(1.46)	3.87(1.40)	4.05(1.18)	3.88(1.46)	4.02(1.36)
Problems with parents						
Parental relationship	2.94(0.42)	2.80(0.45)	2.72(0.48)	2.84(0.40)	2.67(0.39)	2.65(0.38)
Psychological control	1.50(0.42)	1.53(0.34)	1.55(0.40)	1.51(0.33)	1.61(0.42)	1.60(0.34)
Parental criticism	2.13(0.67)	2.28(0.68)	2.19(0.74)	2.16(0.62)	2.47 (0.70)	2.44(0.78)
Internalizing behaviors						
Depression	2.04(0.51)	2.14(0.61)	2.32(0.69)	2.19(0.61)	2.50(0.73)	2.60(0.80)
Emotional reactivity	1.97(0.63)	2.21(0.58)	2.48(0.92)	2.42(0.82)	2.71(0.93)	2.78(0.87)
Self-esteem	3.84(0.61)	3.70(0.73)	3.58(0.77)	3.67(0.73)	3.34(0.66)	3.21(0.73)
Social anxiety	1.67(0.45)	1.78(0.45)	1.86(0.54)	1.86(0.54)	2.01(0.55)	2.01(0.48)
Suicidal ideation						
Past year ideation	1.36(0.73)	1.89(1.11)	1.69(1.05)	1.57(0.76)	2.18(1.33)	2.26(1.24)
Future attempt	1.43(0.80)	1.52(0.87)	1.62(1.11)	1.59(0.83)	2.00 (1.20)	2.09(1.19)
Problems with peers	3.27(0.42)	3.12(0.53)	3.10(0.47)	3.07(0.52)	2.96(0.44)	2.97(0.48)

Note. Higher scores indicate greater delinquency, greater alcohol frequency, greater number of drinks, greater parental relationship quality, greater psychological control, greater parental criticism, greater depression, greater emotional reactivity, greater self-esteem, greater social anxiety, greater past year ideation, greater likelihood of future attempt, and greater friendship quality.

Table 2-2

Self-Injury Groups

	Lifetime NSSI at Time 1	Current NSSI at Time 1	Current NSSI at Time 2
No NSSI	No	No	No
Beginners	No	No	Yes
Recovered Injurers	Yes	No	No
Relapsed Injurers	Yes	No	Yes
Desisters	Yes	Yes	No
Persistent Injurers	Yes	Yes	Yes

Table 2-3.

Group Differences in NSSI characteristics at Time 1

	Recovered N = 195	Relapsers N = 42	Desisters N = 134	Persistent N = 68
Lifetime frequency of NSSI	3.05(1.19) ^a	1.23(0.19) ^a	4.19(1.26) ^b	4.41(1.31) ^b
Pain when self-injuring	1.99(0.71) ^a	2.06(0.78) ^a	2.08(0.73) ^a	2.20(0.71) ^a
Time elapsed	2.35(1.67) ^a	2.20(1.87) ^a	1.98(1.58) ^a	2.00(1.65) ^a
Alone when self-injuring	2.39(0.73) ^a	2.26(0.85) ^a	2.31(0.76) ^a	2.19(0.72) ^a
Desire to stop self-injuring	2.66(0.52) ^a	2.37(0.78) ^{a,b}	2.53(0.67) ^a	2.21(0.76) ^b

Note. Means in the same row with different superscripts are significantly different at $p < .001$. Means in the same row with the same subscripts do not significantly differ. Higher scores indicate greater frequency of engagement in NSSI, greater pain during NSSI, greater time elapsed between urge to self-injure and act of NSSI, more likely to be alone when engaging in NSSI, and greater desire to stop NSSI.

Table 2-4

Standardized means differences among groups at Time 1 and Time 2

	Beginners N = 27	Recovered N = 195	Relapsers N = 42	Desisters N = 134	Persistent N = 68	No NSSI N = 200
Time 1						
Delinquency and alcohol use	-0.18(0.94) ^a	0.02(0.82) ^a	0.23(1.13) ^a	0.07(0.89) ^a	0.07(0.87) ^a	-0.12(0.82) ^a
Problems with parents	0.20(0.89) ^a	-0.03(0.79) ^{a,b}	0.00(0.81) ^{a,b}	0.13(0.85) ^{a,b}	0.36(0.86) ^b	-0.21(0.76) ^a
Internalizing behaviors	0.07(0.79) ^{a,b}	0.00(0.80) ^{a,b}	-0.25(0.58) ^a	0.22(0.93) ^{b,c}	0.52(0.86) ^c	-0.27(0.80) ^a
Suicidal ideation	0.09(0.75) ^b	0.01(0.85) ^b	-0.08(0.70) ^{a,b}	0.17(0.98) ^b	0.67(1.26) ^c	-0.34(0.40) ^a
Problems with peers	0.11(0.95) ^{a,b}	0.01(1.06) ^{a,b}	-0.19(0.87) ^a	0.16(0.98) ^{a,b}	0.46(0.92) ^b	-0.25(0.94) ^a
Time 2						
Delinquency and alcohol use	0.06(1.08) ^a	-0.01(0.81) ^a	0.19(1.03) ^a	0.04(0.79) ^a	0.25(01.01) ^a	-0.15(0.78) ^a
Problems with parents	0.26(1.05) ^{b,c}	-0.02(0.85) ^{a,b}	0.17(0.88) ^{a,b,c}	0.05(0.84) ^{a,b,c}	0.43(0.89) ^c	-0.23(0.78) ^a
Internalizing behaviors	0.16(0.92) ^b	-0.04(0.77) ^{a,b}	0.01(0.74) ^{a,b}	0.11(0.87) ^b	0.70(0.97) ^c	-0.29(0.77) ^a
Suicidal ideation	0.39(1.20) ^c	-0.12(0.77) ^{a,b}	0.24(1.03) ^c	0.13(0.88) ^{b,c}	0.86(1.32) ^d	-0.36(0.42) ^a
Problems with peers	0.31(1.31) ^b	0.00(0.98) ^{a,b}	0.06(1.02) ^{a,b}	0.13(1.01) ^{a,b}	0.32(0.94) ^b	-0.24(0.93) ^a

Note. Means in the same row with different superscripts are significantly different at $p < .001$. Means in the same row with the same subscripts do not significantly differ. Higher scores indicate greater delinquency and alcohol use, problems with parents, internalizing behaviors, suicidal ideation, and problems with peers.

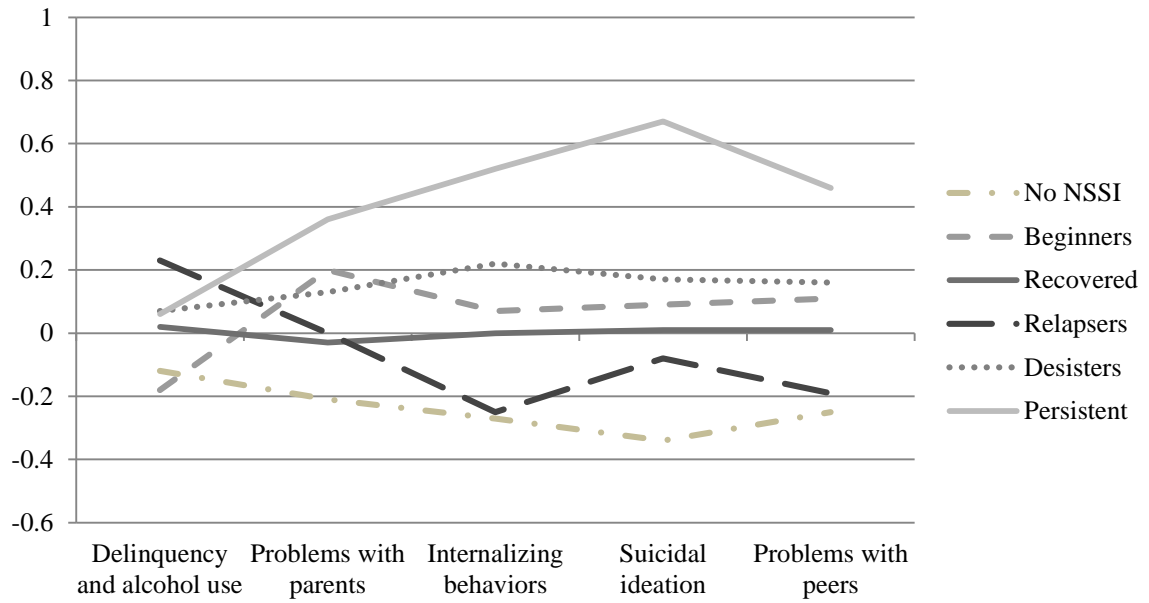


Figure 2-1a. *Standardized group means on psychosocial indices at Time 1*

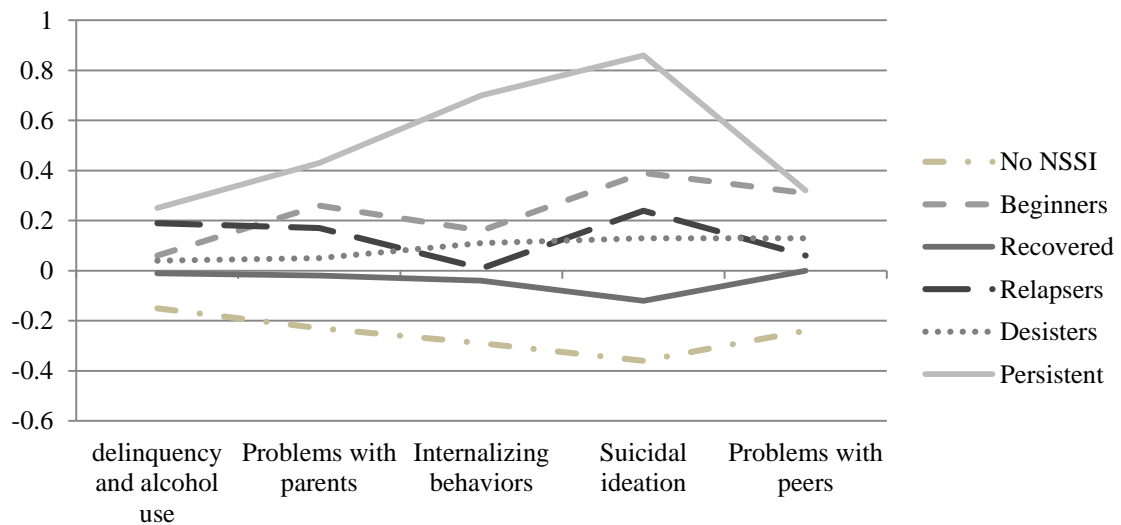


Figure 2-1b. *Standardized group means on psychosocial indices at Time 2*

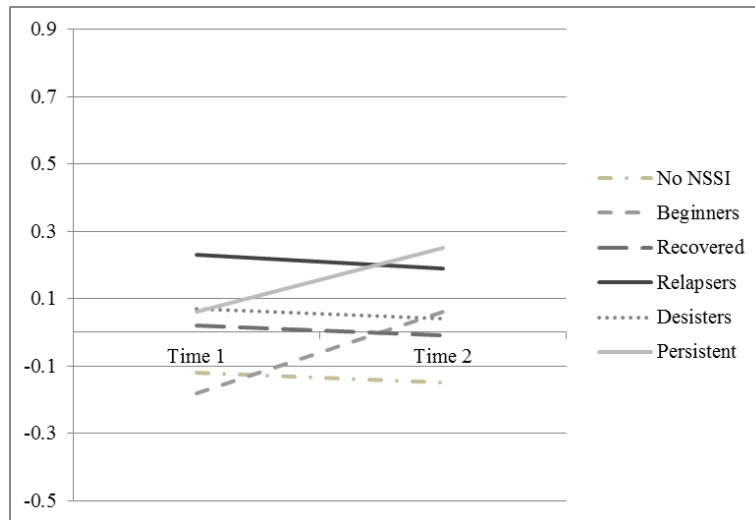


Figure 2-2a. *Changes in delinquency and alcohol use over time*

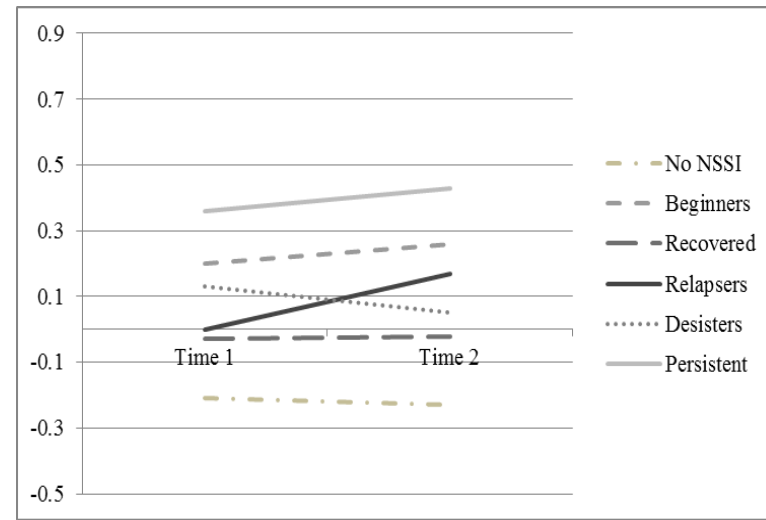


Figure 2-2b. *Changes in problems with parents over time*

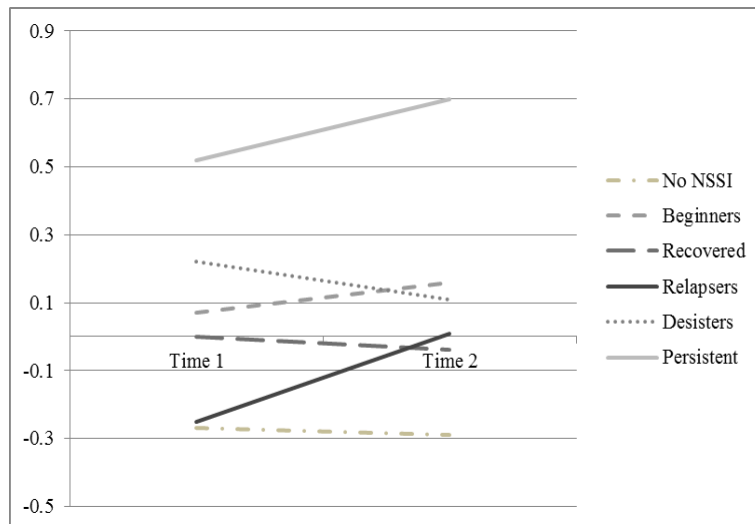


Figure 2-2c. *Changes in internalizing behaviors over time*

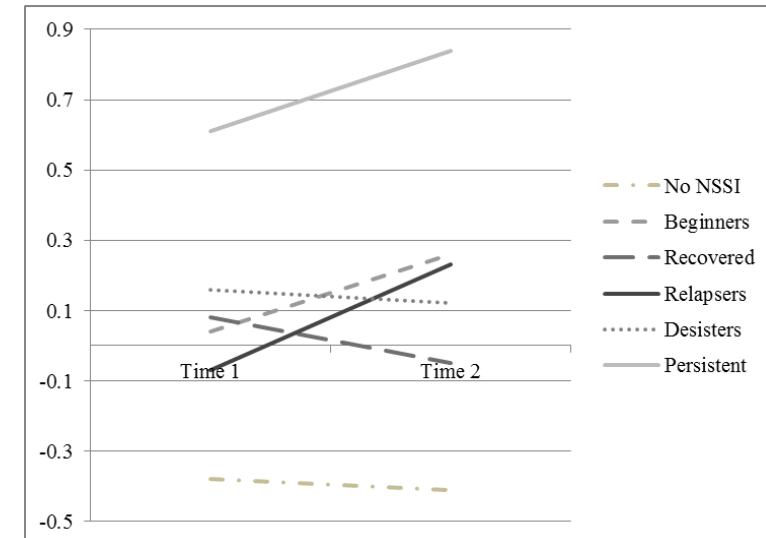


Figure 2-2d. *Changes in suicidal ideation over time*

Chapter 3 (Study 2): Nonsuicidal self-injury and suicidal behavior: A latent class analysis among young adults³

Nonsuicidal self-injury (NSSI) refers to the direct and deliberate destruction or alteration of bodily tissue in the absence of suicidal intent (Nock & Favazza, 2009), and includes behaviors such as self-cutting, carving, burning and hitting (Heath, Toste, Nedecheva & Charlebois, 2008). Among clinical inpatient samples, as many as 21% of adults (Briere & Gil, 1998) and 30 to 40% of adolescents engage in NSSI (Darche, 1990; Jacobson, Muehlenkamp, Miller & Turner, 2008). NSSI is not only a clinical health concern, however, as recent estimates indicate that as many as 12-38% of young adults report lifetime histories of NSSI (Gratz, Conrad & Roemer, 2002; Klonsky & Glenn, 2009; Whitlock & Knox, 2007). Although NSSI tends to have its onset in adolescence, close to 40% of individuals who engage in NSSI report first time engagement between the ages of 17 and 24 years (Heath et al., 2008; Whitlock, Eckenrode & Silverman, 2006). Moreover, as 35-72% of self-injuring young adults report current engagement in NSSI (Glenn & Klonsky, 2011; Heath, Ross, Toste, Charlebois & Nedecheva, 2009; Wilcox et al., 2012), which has led researchers to conclude that NSSI is a widely occurring health concern among university students. Although NSSI differs from suicidal behavior on the basis of non-lethal intent (Andover & Gibb, 2010) researchers have consistently found that young adults who engage in NSSI are at increased risk for suicidal behavior as compared to individuals who do not engage in NSSI (Asarnow et al., 2011;

³ A version of this chapter has been published. Hamza, C. A., & Willoughby, T. (2013). Nonsuicidal self-injury and suicidal behavior: A latent class analysis among young adults. *PLOS ONE*, 8, e59955.

Glenn & Klonsky, 2009; Prinstein et al., 2008; Whitlock & Knoz, 2007; Wilkinson, Kelvin, Roberts, Dubicka & Goodyear, 2011; for a review see Hamza, Stewart & Willoughby, 2012). At the same time, however, only a minority of young adults who engage in NSSI actually engage in suicidal behavior (e.g., suicidal attempt; Klonsky & Olino, 2008). Given the high prevalence of NSSI among community-based samples, identifying individuals with a history of NSSI who are at risk for suicidal behavior is of critical importance to researchers, clinicians, and health care providers (Brausch & Gutierrez, 2010). The purpose of the present study was to identify individuals with a history of NSSI most at risk for past, present and future suicidal behavior. In addition, we examined whether self-injurers with varying degrees of suicidal risk differed on several psychosocial indices.

Assessing Risk for Suicidal Behavior

According to Joiner's (2005) interpersonal theory of suicide, greater involvement in NSSI increases an individual's acquired capability for suicide by habituating the individual to the fear and pain associated with taking one's own life (Joiner, 2005; Nock, Joiner, Gordon, Lloyd-Richardson & Prinstein, 2006). Individuals who engage in more frequent and severe NSSI, therefore, would be expected to be at greater risk for suicidal ideation and attempts. In support of Joiner's theory, more frequent engagement in NSSI (Andover & Gibb, 2010; Prinstein et al., 2008; Whitlock & Knox, 2007), and greater time spent engaging in NSSI, particularly when alone (Glenn & Klonsky, 2009; Nock et al., 2006; Whitlock, Muehlenkamp & Eckenrode, 2008; Muehlenkamp, Ertlet, Miller & Claes, 2011) have been associated with increased risk for suicidal attempts. Moreover, individuals who engage in multiple methods of NSSI (e.g., cutting, burning, etc.) are at

greater risk for suicidal behavior as compared to individuals who engage in fewer methods of NSSI (Nock et al., 2006).

Recent research indicates that individuals with varying levels of engagement in NSSI may also be differentiated on the basis of psychosocial risk. More specifically, in two studies, Klonsky and Olino (2008) and Whitlock and colleagues (2008) compared subgroups of individuals with varying NSSI histories on measures of psychosocial risk. In both of these studies, researchers identified a high risk group of self-injurers who reported frequent engagement in NSSI involving multiple methods and functions. The high risk NSSI groups were also differentiated from other NSSI groups on several measures of psychosocial risk (i.e., depressive symptoms, anxiety, BPD, history of childhood abuse) and reporting of suicidal attempts.

Although the findings of Klonsky and Olino (2008) and Whitlock et al. (2008) indicate that individuals who engage in NSSI can be divided into subgroups depending on their NSSI characteristics (e.g., frequency), these researchers did not specifically seek to examine whether individuals with a history of NSSI could be categorized on the basis of their engagement in *both* NSSI and suicidal behavior. Similar to NSSI, there is likely to be individual variability in suicidal behavior. Grouping individuals on the basis of their engagement in both NSSI and suicidal behavior, therefore, may provide a more nuanced examination of the heterogeneity among individuals with varying histories of self-injurious behavior (e.g., frequent NSSI but low suicidal risk vs. frequent NSSI and high suicidal risk). Moreover, Klonsky and Olino and Whitlock et al. specifically examined significant group differences in lifetime suicidal ideation and attempts, but current

suicidal ideation and self-reported likelihood of future suicidal attempts may also be important predictors of suicidal risk.

In the present study, we address these gaps in the literature by utilizing Latent Class Analysis (LCA) to specifically examine individual variability in both NSSI and suicidal behavior among a sample of young adults with a history of NSSI. Our objective was to identify those individuals with a history of NSSI most at risk for suicidal behavior. LCA is a person-centered analysis in which relationships among individuals, rather than relationships among variables, are of primary interest (Bergman & Magnusson, 1997). In addition to assessing lifetime suicidal ideation and attempts, we also included a measure of recent suicidal ideation and self-reported risk for future suicidal attempts. We expected to identify a subgroup of nonsuicidal self-injurers at high risk for suicidal behavior (Joiner, 2005). Moreover, we expected that self-injurers who were most at risk for suicidal behavior would be differentiated from the rest of the sample by greater psychosocial risk.

Method

Participants

The current sample was drawn from a larger sample of 1,090 (70.3% female) first-year undergraduate students ($Mage = 19.11$, $SD = 1.05$) from a mid-sized Canadian university who completed a survey about aspects of the university experience that create or reduce stress. In total, 439 respondents indicated that they had engaged in NSSI at least once and were included in the present study. Only participants who reported a history of NSSI were prompted to complete additional questions about their engagement in NSSI. Participation in this study was open to all first-year students regardless of major.

In total, 87.5% of the participants were born in Canada. Consistent with the broader demographics of the region, the most common ethnic backgrounds reported other than Canadian were British (19%), Italian (16.8%), French (9.5%) and German (9%; Statistics Canada, 2006). Data on socioeconomic status indicated mean levels of education for mothers and fathers falling between “some college, university or apprenticeship program” and “completed a college/apprenticeship/technical diploma.” Furthermore, 15% of respondents lived at home with one or both parents, 9% lived off-campus with roommates, and 76% lived in campus residences. In total, less than 2% of data was missing due either to non-response or an insufficient number of responses. Missing values were imputed using the EM (expectation-maximum) algorithm. Methodological research has demonstrated that ML estimation is preferable to pair-wise deletion, list-wise deletion, or means substitution (Schafer & Graham, 2002).

Procedure

Students in first-year university were invited to complete a survey examining adjustment in university, by way of posters, class room announcements, website posting, and residence visits. Students could participate regardless of academic major, and were given monetary compensation (\$10) or course credit for their participation. The survey was administered by trained research personal. The study was approved by Brock University Ethics Board, and all participants provided informed written consent before participation. No minors/children were involved in the study, so no informed consent was obtained from next of kin, caretakers, or guardians.

Measures

Demographics. Age, sex, ethnicity, and parental education (one item per parent), averaged for participants reporting on both parents ($r = .40$) were assessed on a scale of 1 (did not finish high school) to 6 (professional degree).

Nonsuicidal self-injury (NSSI). Participants completed the Inventory of Statements about Self-Injury (ISAS; Klonsky & Glenn, 2009) to specifically address whether they had engaged in direct forms of self-injury. A list of eight self-injurious behaviors was provided (e.g., cutting, burning and head banging) and participants were asked to indicate how many times they had intentionally engaged in each of the behaviors listed, without lethal intent. Participant responses regarding lifetime frequency of NSSI were collapsed into the following six categories to create a normalized measure of NSSI frequency: 1 incident, 2-4 incidents, 5-10 incidents, 11-50 incidents, 51-100 incidents, more than 100 incidents (see Heath et al., 2008 for a similar categorization). The Cronbach's alpha for NSSI frequency was .77. The number of NSSI methods that participants engaged in was calculated by totalling the different types of NSSI behaviors participants endorsed. Participants were also asked to indicate whether they experienced physical pain while self-injuring (1 = no, 2 = sometimes, 3 = yes), the amount of time elapsed between the urge to self-injure and the act of NSSI (i.e., 1 = less than one hour to 6 = more than 1 day), age of most recent NSSI, and whether they self-injured alone (1 = no, 2 = sometimes, 3 = yes). The ISAS has been shown to have good internal consistency and construct validity in previous research (Glenn & Klonsky, 2011; Klonsky & Glenn, 2009)

Suicidal Thoughts and Behavior. Participants completed the Suicide Behaviors Questionnaire-Revised (SBQR; Osman, 2002) which includes four items assessing four

different dimensions of suicidality. Participants indicated: 1) whether they had ever thought about or attempted to kill themselves (i.e., lifetime suicidal ideation/attempt) on a scale from 1 (never) to 6 (I have attempted to kill myself and really hoped to die), 2) their frequency of suicidal ideation over the past 12 months (i.e., recent suicidal ideation) on a scale from 1 (never) to 5 (very often), 3) whether they had previously disclosed to anyone that they were going to attempt suicide (i.e., disclosure about suicidal behaviour) on a scale from 1 (no) to 5 (yes, more than once and really wanted to do it), and 4) their likelihood of a future suicidal attempt (i.e., future suicidal behaviour) from 1 (never) to 7 (very likely). The Cronbach's alpha for the SBQR was .74, and the SBQR has been shown to have good internal consistency and validity in both clinical and non-clinical samples in previous research (Osman, 2002)

Daily Hassles. Daily Hassles was assessed using 26 items in which participants were asked to indicate the frequency of being bothered by daily hassles with friends, peers, and university work (e.g., trying to get good marks, difficulties with emotion regulation) using a 3-point scale from 1 (almost never bothers me) to 3 (often bothers me). This scale was adapted from McNamara, Willoughby, and Chalmers (2005), and the Cronbach's alpha for the scale was .84.

Difficulties with Emotion Regulation. Participants also completed the Difficulties with Emotion Regulation Scale (DERS; Gratz & Roemer, 2004) which included six items (e.g., when I'm upset, I have difficulty concentrating), assessed on a scale from 1 (not at all like me) to 5 (completely like me). The Cronbach's alpha for the scale was .74. The DERS has been shown to have good internal consistency and

discriminant validity among adolescents and university students (Gratz & Roemer, 2004; Weinberg & Klonsky, 2009).

Depressive Symptoms. Depressive symptoms were measured using the Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977). Participants indicated how often they experienced 20 depressive symptoms (e.g., felt sad) from 1 (none of the time) to 5 (most of the time). The Cronbach's alpha for the scale was .91. The CES-D has also been shown to have good internal reliability in previous research (Kim & Ge, 2000).

Self-Esteem. Self-esteem was assessed using Rosenberg's (1965) 10 item scale (Rosenberg, 1965) which has been widely used and shown to be internally consistent (Shevlin, Bunting & Lewis, 1995). Participants were required to indicate the extent to which they agree or disagree to items such as "I take a positive attitude toward myself" using a five point scale from 1 (strongly disagree) to 5 (strongly agree). Cronbach's alpha for the scale was .90.

Social Anxiety. Social anxiety was assessed using 14 items (e.g., I feel shy around people my age that I do not know) from the Social Anxiety Scale for Children-Revised (SASC-R; La Greca & Stone, 1993). Participants responded using a scale from 1 (almost never or never) to 4 (almost always or always). The SASC-R has been shown to have good internal reliability and validity (Ginsburg, LeGreca & Silverman, 1998) and the Cronbach's alpha for this scale was .90.

Behavioral Inhibition. Behavioral inhibition was assessed using the Behavioral Inhibition Scale (BIS; Carver & White, 1994). The BIS is designed to measure participants' sensitivity to anxiety-provoking situations (e.g., "If I think something

unpleasant is going to happen I usually get pretty worked up”) using a four point scale from 1 (strongly disagree) to 4 (strongly agree). The BIS has been shown to have good internal consistency in previous research (Muris, Rassin, Ingmar & Leemreis, 2007). The Cronbach’s alpha for this scale was .73.

Friendship Quality. Friendship quality was assessed using 18 items (e.g., my friends accept me as I am) from Armsden and Greenberg’s (1987) Inventory of Parent and Peer Attachment (Arnsden & Greenberg, 1987). Participants responded using a scale from 1 (almost never or never) to 4 (almost always or always). Cronbach’s alpha was .89.

Parental Relationship Quality. Participants completed 17 items (e.g., “I trust my mother”) from the Inventory of Parent and Peer Attachment (Armsden & Greenberg, 1987) for both parents using a four point scale from 1 (almost never or never) to 4 (almost always or always). A parental attachment score was calculated by averaging scores from both parents ($r = .48$). Cronbach’s alpha for the scale was .91.

Parental Psychosocial Control. Participants also completed the Psychological Control Scale (Barber, 1996) for both parents (i.e., “my father is a person who changes the subject whenever I have something to say”) using a three point scale from 1 (not at all like him) to 3 (a lot like him). Scores for both parents were averaged into a parental psychological control score ($r = .37$). Cronbach’s alpha for this scale was 0.83.

Parental Criticism. Finally, participants completed the parental criticism subscale from the Multidimensional Perfectionism Scale (Frost, Marten, Lahart & Rosenblate, 1990) which included items such as, “My parents never try to understand my mistakes.” Participants responded using a three point scale from 1 (strongly disagree) to 4 (strongly agree). Cronbach’s alpha for this scale was .82.

Delinquency. Delinquency was measured with five items assessing stealing money from parents/roommates, shoplifting, destroying other people's property, impaired driving, or been the passenger in a vehicle with a driver who was impaired (Shapiro, Siegel, Scovill & Hays, 1998). A composite score was created with higher scores indicating greater delinquency. Cronbachs alpha was .68. High reliability would not be expected given that an individual engaging frequently in one type of delinquent behavior may not necessarily engage frequently in other types of delinquent behaviors (Huizinga & Elliott, 1986).

Plan of Analysis

Latent class analysis (LCA) was conducted using Mplus, Version 6.1 (Muthen & Muthen, 1998-2010) to explore subgroup heterogeneity among individuals engaging in NSSI. Latent class indicators included the NSSI variables (e.g., lifetime frequency, most recent engagement), as well as the suicidal risk variables (e.g., lifetime suicidal ideation and suicidal attempts). In order to determine the number of groups that were best represented by the data, four criteria were considered: 1) Bayesian information criterion (BIC), such that smaller values of BIC indicate a better fit model, 2) significance of the Lo-Mendell-Rubin Adjusted Likelihood Ratio Test (LMR-LRT), such that once non-significance is reached, the number of classes prior to non-significance are defined as the appropriate number, 3) no classes contain less than 5% of the total sample, and 4) that entropy (an index of confidence that individuals belong to the correct class and that adequate separation between latent classes exist) is greater than .80 (Jung & Wickrama, 2008). Following the latent class analysis, one-way ANOVAs and post-hoc follow-up testing (i.e., Tukey) were conducted to compare individuals within each class across

demographic characteristics (i.e., age, sex, parental education) and the psychosocial indices (i.e., daily hassles, difficulties with emotion regulation, depressive symptoms, self-esteem, social anxiety, behavioral inhibition, delinquency, friendship quality, parental attachment, parental psychological control and parental criticism).

Results

Preliminary Analyses

Overall, among our sample of 439 self-injuring young adults, 5.9% of participants had engaged in NSSI once, 15.8% engaged in the behavior 2-4 times, 24% engaged in the behavior 5-10 times, 33.0% engaged in the behavior 11-50 times, 7.1% engaged in the behavior 51-100 times and 14.2% engaged in the behavior more than 100 times. The most commonly endorsed types of self-injury were self-hitting and head banging (21.9%), pinching (24%), and cutting (12.1%). In total, 30.7% reported using only one method of NSSI, 28.8% reported two methods of NSSI, 17.4% reported three methods, 10% reported four methods, and 13.1% reported five or more methods of NSSI.

Primary Analyses

Extraction of Latent Classes. Latent class analyses were conducted for 1-4 class solutions, and the best-fitting solution was three classes (see Table 3-1). The three class model had a lower BIC value relative to the other classes, and an entropy value greater than 0.80. In addition, the three class solution had no classes less than 5%. Furthermore, the LMR-LRT was significant, which indicated that the three class solution provided a better fit to the data than the two class solution. In contrast, the LMR-LRT for the four class solution was non-significant, suggesting the three class solution provided the better fit to the data than the four class solution. Results indicated that 67.7% of participants

belonged to Class 1 (“low frequency NSSI/not high risk for suicidal behavior”).

Individuals in Class 1 were characterized by lower frequency engagement in NSSI, less recent NSSI, and fewer methods of NSSI than the other two classes. Individuals in Class 1 also had lower levels of lifetime suicidal ideation/attempts, less recent suicidal ideation, and less likelihood of future attempt as compared to Class 3 (See Figure 3-1). In contrast, individuals in Class 2 (“high frequency NSSI/not high risk for suicidal behavior,” 19.8%) reported higher frequency of engagement in NSSI, more recent NSSI, and more methods of NSSI as compared to Class 1. Individuals in Class 2, however, similarly reported lower levels of lifetime suicidal ideation/attempts, lower recent suicidal ideation and lower likelihood of future suicidal attempts as compared to Class 3. Finally, individuals in Class 3 (“high frequency NSSI/high risk for suicidal behavior,” 12.5%) reported higher frequency of engagement in NSSI, more recent NSSI and more methods of NSSI than Class 1. Class 3 also reported higher levels of lifetime suicidal ideation/attempts, higher recent suicidal ideation, and greater risk for future suicidal attempts as compared to Class 1 and Class 2. Class 3 was also the only group that met the clinical cutoff for high suicide risk on the SBQ-R, which is why this group was labeled the high risk for suicidal behavior group. To ensure classes were classified appropriately, one-way ANOVAs were conducted using class membership as the independent variable and each of the class indicators as dependent variables. Results supported our class characterizations, and significant group differences are presented in Table 3-2.

Differences among classes on psychosocial indices. Given the use of multiple ANOVAs, a reduced alpha of $p < 0.001$ was used to establish significant differences among groups. Results indicated that groups did not significantly differ across age,

gender, or parental education, all $ps > .001$. Significant group differences were found across psychosocial indices, including daily hassles, difficulties with emotion regulation, depressive symptoms, self-esteem, social anxiety, behavioral inhibition, friendship quality, parental attachment, parental criticism, and parental psychological control. Groups did not significantly differ on delinquency. Follow-up Tukey analyses revealed that overall, Class 3 reported the highest levels of risk across psychosocial indices as compared to Class 1 and Class 2 (see Table 3-3). Although Class 1 and 2 did not significantly differ across many of the psychosocial indices, Class 2 reported significantly lower levels of parental attachment and higher levels of parental psychological control as compared to Class 1.

Non-NSSI group comparison. One issue that the above analyses did not address, was whether the three classes differed on measures of psychosocial risk compared to a non-injuring comparison group. In order to test this issue, we examined whether Class 1, Class 2, and Class 3 significantly differed from a comparison group of a random sample of 250 participants without a history of NSSI taken from the larger sample (see Table 3-4). A random subset of 250 participants was used to ensure that the comparison group was not disproportionately larger than the other groups. The ANOVA analyses and Tukey follow-up comparisons revealed that all the groups did not significantly differ on age, sex or parental education (all $ps > 0.001$). Importantly, Class 1 did not significantly differ from the comparison group on any of the psychosocial indices. In contrast, Class 2 reported significantly greater psychosocial risk than the comparison group on several psychosocial indices (i.e., depressive symptoms, delinquency, parental psychological control, suicidal behavior, self-esteem, friendship quality, and parental

attachment). Finally, Class 3 reported significantly higher risk than the comparison group across *all* of the psychosocial indices.

Discussion

Despite increased research on the association between NSSI and suicidal behavior (Hamza, Stewart & Willoughby, 2012) little research has examined individual variability in suicidal risk among individuals engaging in NSSI. To identify individuals with a history of NSSI most at risk for suicidal behaviour, we conducted a person-centered analysis (i.e., LCA) among a sample of young adults with a history of NSSI. Results of the LCA revealed three distinct subgroups of individuals with varying presentations of NSSI and suicidal behavior. The three subgroups differed not only with respect to their patterns of self-injurious behaviors, but they also could be discriminated on measures of psychosocial risk. These findings offer clinicians with new insight into who may be most at risk for suicidal behaviour among nonsuicidal self-injurers, and can serve to inform intervention and prevention programming aimed at reducing suicidal risk among individuals with a history of NSSI.

The first subgroup we identified consisted of 68% of young adults with a history of NSSI (i.e., Class 1). Individuals in this group were characterized by lower frequency engagement in NSSI, and fewer methods of NSSI, than the other two groups (i.e., Class 2 and 3). Importantly, individuals in our “low frequency NSSI/not at high risk for suicidal behavior” group were also characterized by lower levels of suicidal behavior compared to the other two classes. Moreover, these individuals did not report higher levels of suicidal risk as compared to the comparison group of non-injuring participants. Thus, although 39.5% of the larger sample reported a history of NSSI, the results of the present study

indicate that the majority of young adults who engage in NSSI do so infrequently and are not at elevated risk for suicidal behavior. Thus, future research on the link between NSSI and suicidal behavior should take into account variability among individuals engaging in NSSI.

The other two classes of self-injurers consisted of individuals who engaged in more frequent NSSI, recent NSSI, and more methods of NSSI than Class 1. Importantly, although these individuals shared similar NSSI characteristics, they differed on the basis of their engagement in suicidal behavior. Our study is the first, therefore, to identify variability in suicidal risk among individuals engaging in frequent and multiple methods of NSSI. Our findings suggest that assessing the frequency, number of methods, or age of most recent NSSI, may not be sufficient to identify individuals most at risk for suicidal behavior. In fact, although Class 2 reported the most frequent engagement in NSSI, as well as the most methods of NSSI, these individuals reported significantly lower levels of engagement in suicidal behavior as compared to Class 3. Only by conducting a person-centered analysis using both NSSI and suicidal behavior were we able to identify these two distinct groups.

There were two other important ways that Class 3 (frequent NSSI/high risk for suicidal behavior) could be differentiated from Class 2 (frequent NSSI/not at high risk for suicidal behavior). First, individuals in Class 3 were more likely to self-injure alone than individuals in Class 2. This finding is consistent with work by Glenn and Klonsky (2009), and suggests that the extent to which self-injury occurs alone is an important and easily accessible marker of suicidal risk among self-injurers. Second, we also found that individuals in Class 3 were differentiated by individuals in Class 2 by greater suicidal

ideation, even though they engaged in similarly frequent NSSI behaviors, involving multiple methods. When assessing risk for suicidal behavior among self-injurers, therefore, the assessment of suicidal ideation within the past year may be a more important predictor of suicidal risk than NSSI history.

In a secondary analysis, we compared our three classes of nonsuicidal self-injurers to a comparison group of non-injuring young adults. Importantly, the majority of the self-injurers (i.e., Class 1) did not significantly differ from the comparison group of non-injurers on measures of psychosocial risk. In contrast, individuals in Classes 2 and 3 were at greater psychosocial risk as compared to the group of non-injuring individuals, although Class 3 reported greater psychosocial risk than Class 2. It is important to note, however, that only individuals in Class 3 met the clinical cutoff for high suicidal risk on the SBQ-R. Recall that according to Joiner (2005), individuals who engage in NSSI on a frequent basis may be at increased risk for suicidal behavior because they habituate to the fear and pain associated with taking one's own life (i.e., acquired capability for suicide, Nock et al., 2006). Another tenant of Joiner's theory, however, is that only individuals who experience suicidal desire (i.e., perceived burdensomeness and thwarted belongingness) and have acquired capability for suicide, will actually make a suicidal attempt (Van Orden, Witte, Gordon, Bender & Joiner, 2008). Therefore, it may be that individuals in Class 3 were at greatest risk for suicidal behavior engagement because they engaged in highly frequent NSSI (i.e., higher levels of acquired capability for suicide), as well as experienced high levels of psychosocial risk (i.e., greater risk for suicidal desire) and suicidal ideation. Our findings highlight the importance of assessing NSSI history, in

combination with psychosocial risk, to identify those individuals most at risk for suicidal behavior.

An unexpected finding that is important to highlight, however, is that individuals in Classes 2 and 3 reported significantly greater pain during NSSI than Class 1. Recall that Nock and colleagues (2006) found that no pain during NSSI was associated with increased risk for suicidal behavior, which is more consistent with Joiner's theory that NSSI habituates an individual to the pain associated with taking one's own life (Joiner, 2005; Van Orden et al., 2008). It may be, however, that individuals who have become desensitized to the pain during NSSI (i.e., frequent engagers in NSSI), increase the frequency and number of methods used during NSSI to increase painful experiences. Indeed, two commonly endorsed motivations for engaging in NSSI are anti-dissociation (i.e., to reduce feelings of numbness) and feeling generation (i.e., to feel something, even if it is pain; Klonsky & Glenn, 2009). If NSSI does lead to decreased sensitivity to pain over time, then individuals may have to increase their frequency of engagement in NSSI to produce the desired experience of pain.

Limitations

Despite the many strengths of our study, including the use of a large sample, our unique attempt to assess subgroups of self-injurers, as well as the assessment of several characteristics of NSSI and suicidal behavior, our study is not without limitations. First, given the concurrent design of the present study, we cannot be certain about the directionality of effects. Although theory (Joiner, 2005), recent research (Hamza, Stewart & Willoughby, 2012) and longitudinal findings (Asarnow et al., 2011; Wilkinson et al., 2011) indicate that NSSI increases risk for suicidal behavior (and not vice versa), we did

not directly test bidirectional associations among NSSI and suicidal behavior. It may be that suicidal behavior, therefore, also increases risk for NSSI. Moreover, although we found several psychosocial indices that differentiated our three subgroups, it is unclear whether each of the subgroups reported greater risk prior to their engagement in self-injurious behavior, or as a result of their engagement in self-injurious behaviors. Only longitudinal research can specifically address whether the psychosocial indices we assessed preceded the development of self-injurious behavior. Nevertheless, our findings provide clinicians with several measures of psychosocial risk that can be used to discriminate self-injurers at high risk for current and future suicidal behavior.

Secondly, although the present sample included a large sample representative of a particular university in Canada, the majority of the participants enrolled in the study were of western descent and born in Canada; therefore, our findings may not generalize to other geographic regions, including those with differing ethnic and/or demographic backgrounds. Furthermore, our study specifically sampled first-year university students and therefore may not be generalizable to the wider student population (i.e., upper year students) or young adults not attending university. It should also be noted that previous research has found that clinical samples report greater co-occurrence of NSSI and suicidal behavior as compared to community-based samples (Asarnow et al., 2011); therefore, the latent class analysis we applied may yield different results among a clinical sample. Regardless, research has shown that first year university may represent a period of increased NSSI initiation, as well as increased risk for suicidal ideation (Heath et al., 2008; Whitlock et al., 2008), so understanding risk for NSSI and suicidal behavior during

this time period is important to clinicians and school-based counselors in the areas of risk assessment and intervention.

Third, our study required participants to recall their lifetime engagement in NSSI and suicidal behavior, so it is possible that our study is subject to recall errors.

Importantly, in addition to assessing lifetime NSSI and suicidal behavior, we also tried to incorporate assessments of more recent self-injurious behavior engagement, by including age of most recent NSSI, as well as past year suicidal ideation. Regardless, it would be useful for future research to assess frequency of NSSI and suicidal behavior in real time, using ecological moments sampling, such as the use of daily diaries. Reporting on multiple incidents of NSSI and behaviors would also provide an opportunity to assess the characteristics of multiple episodes of self-injurious behaviors.

Conclusions

In the present study, we sought to identify individuals with a history of NSSI who were most at risk for suicidal behavior. Importantly, we found that the majority of young adults who engaged in NSSI did so infrequently, and did not engage in suicidal behaviors (i.e., no greater risk than a comparison group of non-injurers). Among the minority of young adults who engaged in more frequent NSSI, recent NSSI, and multiple methods of NSSI, we identified two distinct subgroups of individuals (i.e., Class 2 and Class 3). Individuals in Class 3 met the clinical cutoff score for high risk for suicidal behavior on the SBQ-R, and were differentiated from the other classes by greater frequency of being alone when self-injuring, and higher levels of psychosocial risk. To identify individuals with a history of NSSI who are most at risk for suicidal behavior, therefore, clinicians should assess NSSI frequency and scores on the SBQ-R, particularly degree of current

suicidal ideation. Moreover, clinicians should also inquire about the social context in which NSSI occurs, and the extent to which individuals are experiencing psychosocial risk (e.g., depressive symptoms, anxiety).

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Table 3-1

Fit Indices for Latent Class Analysis

	1	2	3	4
BIC	13900.997	13419.045	13312.442	13256.482
Entropy	-	0.950	0.838	0.837
Class > 5%	No	No	No	No
LMR-LRT	-	Sig	Sig	NS

Note: BIC= Bayesian information criterion (smaller values indicate better model fit).

Entropy at least .80 (higher values indicates well identified classes). Class > 5% (any class smaller than 5% not sufficient). LMR-LRT = Lo-Mendell-Rubin Adjusted

Likelihood Ratio Test, test of fit between the model of interest (e.g., three-class model) and the model with one less class (e.g., two-class model). Sig = significant. NS=non-significant.

Table 3-2

Significant differences among classes on latent class characteristics – means and standard deviations

	DF1	DF2	F	p	η^2	Class 1 (N = 297)	Class 2 (N = 87)	Class 3 (N = 55)
Lifetime frequency of NSSI	2	436	90.34	***	.37	3.04 (1.12) ^a	5.10(0.95) ^c	4.29 (1.10) ^b
Age of most recent NSSI	2	436	8.54	***	.05	16.24 (2.08) ^a	17.21 (1.86) ^{a,b}	17.82 (1.89) ^b
Pain during NSSI	2	436	7.32	.001	-	2.05 (0.71) ^a	2.31 (0.65) ^b	2.23 (0.74) ^b
Time elapsed NSSI	2	436	1.44	.348	-	2.19 (1.64) ^a	2.22 (1.83) ^a	1.86 (1.36) ^a
Number of methods of NSSI	2	436	139.33	***	.48	1.78 (0.82) ^a	4.40 (1.44) ^c	3.65 (1.94) ^b
Alone during NSSI	2	436	5.31	.005	-	2.27 (0.77) ^a	2.38 (0.68) ^a	2.69 (0.53) ^b
Lifetime suicidal ideation/attempts	2	436	71.89	***	.25	1.62 (0.89) ^a	2.33 (1.34) ^b	3.53 (1.46) ^c
Past year suicidal ideation	2	436	255.48	***	.54	1.27 (0.59) ^a	1.37 (0.59) ^a	3.58 (1.97) ^b
Disclosure about suicide	2	436	19.89	***	.08	1.28 (0.63) ^a	1.70 (1.01) ^b	1.93 (1.08) ^b
Future suicide attempt	2	436	217.16	***	.50	1.31 (0.64) ^a	1.56 (0.76) ^a	3.62 (1.16) ^b
Total SBQ-R score	2	436	257.50	***	.62	4.40(1.61) ^a	5.56(1.71) ^b	10.74(1.59) ^c

Note. Means in the same row with different superscripts are significantly different at $p < .001$. Higher scores indicate greater frequency of engagement in NSSI, age of most recent NSSI, time elapsed between urge to self-injure and act of NSSI, number of methods of NSSI, more lifetime suicidal ideation/attempts, greater past year suicidal ideation, greater disclosure about suicidal behavior, more likely to make a future suicidal attempt. Scores on the SBQR range from 3-18, with a clinical cutoff score of 7.

*** = $p < 0.001$.

Table 3-3

Significant differences among classes psychosocial indices – means and standard deviations

	DF1	DF2	F	p	η^2	Class 1 (N = 297)	Class 2 (N = 87)	Class 3 (N = 55)
Daily hassles	2	436	13.37	***	.06	1.93 (0.30) ^a	1.99 (0.29) ^a	2.16 (0.29) ^b
Difficulties with emotion regulation	2	436	14.44	***	.06	2.85 (0.71) ^a	2.89 (0.82) ^a	3.43 (0.66) ^b
Depressive symptoms	2	436	43.84	***	.20	2.14 (0.62) ^a	2.28 (0.59) ^a	2.99 (0.67) ^b
Self-esteem	2	436	39.72	***	.15	3.80 (0.67) ^b	3.58 (0.67) ^b	2.95 (0.60) ^a
Social anxiety	2	436	20.47	***	.09	1.74 (0.52) ^a	1.83 (0.51) ^a	2.24 (0.61) ^b
Behavioral inhibition	2	436	13.37	***	.06	2.76 (0.44) ^a	2.81 (0.45) ^a	3.09 (0.38) ^b
Delinquency	2	436	1.13	.323	-	1.48 (0.57) ^a	1.58 (0.58) ^a	1.55 (0.55) ^a
Friendship quality	2	436	11.56	***	.05	3.19 (0.48) ^b	3.09 (0.49) ^b	2.85 (0.42) ^a
Parental attachment	2	436	18.72	***	.08	2.87 (0.43) ^c	2.68 (0.47) ^b	2.52 (0.39) ^a
Parental criticism	2	436	6.88	***	.03	2.11 (0.71) ^a	2.29 (0.77) ^{a,b}	2.48 (0.74) ^b
Parental psychological control	2	436	9.95	***	.04	1.48 (0.36) ^a	1.67 (0.44) ^b	1.64 (0.39) ^b

Note. Means in the same row with different superscripts are significantly different at $p < .001$. Higher scores indicate greater daily hassles, difficulties with emotion regulation, depressive symptoms, self-esteem, social anxiety, behavioral inhibition, delinquency, friendship quality, parental attachment, parental criticism and parental psychological control. Scores on the SBQR range from 3-18, with a clinical cutoff score of 7. *** $p < 0.001$.

Table 3-4

Class comparisons to a group of non-injurers

Psychosocial Indices	Control (N = 250)	Class 1 (N = 298)	Class 2 (N = 86)	Class 3 (N = 55)
Daily hassles	1.91 (0.33) ^a	1.93 (0.30) ^a	1.99 (0.29) ^a	2.16 (0.29) ^b
Difficulties with emotion regulation	2.69 (0.76) ^a	2.85 (0.71) ^a	2.89 (0.82) ^a	3.43 (0.66) ^b
Depressive symptoms	2.01 (0.63) ^a	2.14 (0.62) ^{a,b}	2.28 (0.59) ^b	2.99 (0.67) ^c
Self-esteem	3.91 (0.67) ^c	3.80 (0.67) ^{c,b}	3.58 (0.67) ^b	2.95 (0.60) ^a
Social anxiety	1.68 (0.51) ^a	1.74 (0.52) ^a	1.83 (0.51) ^a	2.24 (0.61) ^b
Behavioral inhibition	2.72 (0.48) ^a	2.76 (0.44) ^a	2.81 (0.45) ^a	3.09 (0.38) ^b
Delinquency	1.34 (0.51) ^a	1.48 (0.57) ^{a,b}	1.58 (0.58) ^b	1.55 (0.55) ^b
Friendship quality	3.29 (0.47) ^c	3.19 (0.48) ^{c,b}	3.09 (0.49) ^b	2.85 (0.42) ^a
Parental attachment	2.91(0.44) ^c	2.87 (0.43) ^c	2.68 (0.47) ^b	2.52 (0.39) ^a
Parental criticism	2.03 (0.74) ^a	2.11 (0.71) ^a	2.29 (0.77) ^{a,b}	2.48 (0.74) ^b
Parental psychological control	1.40 (0.34) ^a	1.48 (0.36) ^a	1.67 (0.44) ^b	1.64 (0.39) ^b
Lifetime suicidal ideation/attempts	1.40 (0.82) ^a	1.62 (0.89) ^a	2.33 (1.34) ^b	3.53 (1.46) ^c
Past year suicidal ideation	1.25 (0.68) ^a	1.27 (0.59) ^a	1.37 (0.59) ^a	3.58 (1.97) ^b
Disclosure about suicide	1.11 (0.44) ^a	1.28 (0.63) ^a	1.70 (1.01) ^b	1.93 (1.08) ^b
Future attempt	1.24 (0.69) ^a	1.31 (0.64) ^{a,b}	1.56 (0.76) ^b	3.62 (1.16) ^c

Note. Means in the same row with different superscripts are significantly different at $p < .001$. Higher scores indicate greater daily hassles, greater difficulties with emotion regulation, greater depressive symptoms, higher self-esteem, greater social anxiety, greater behavioral inhibition, greater delinquency, greater friendship quality, greater parental attachment, greater parental criticism, greater parental psychological control, more lifetime suicidal ideation/attempts, greater past year suicidal ideation, greater disclosure about suicidal behavior, and more likely to make a future suicidal attempt.

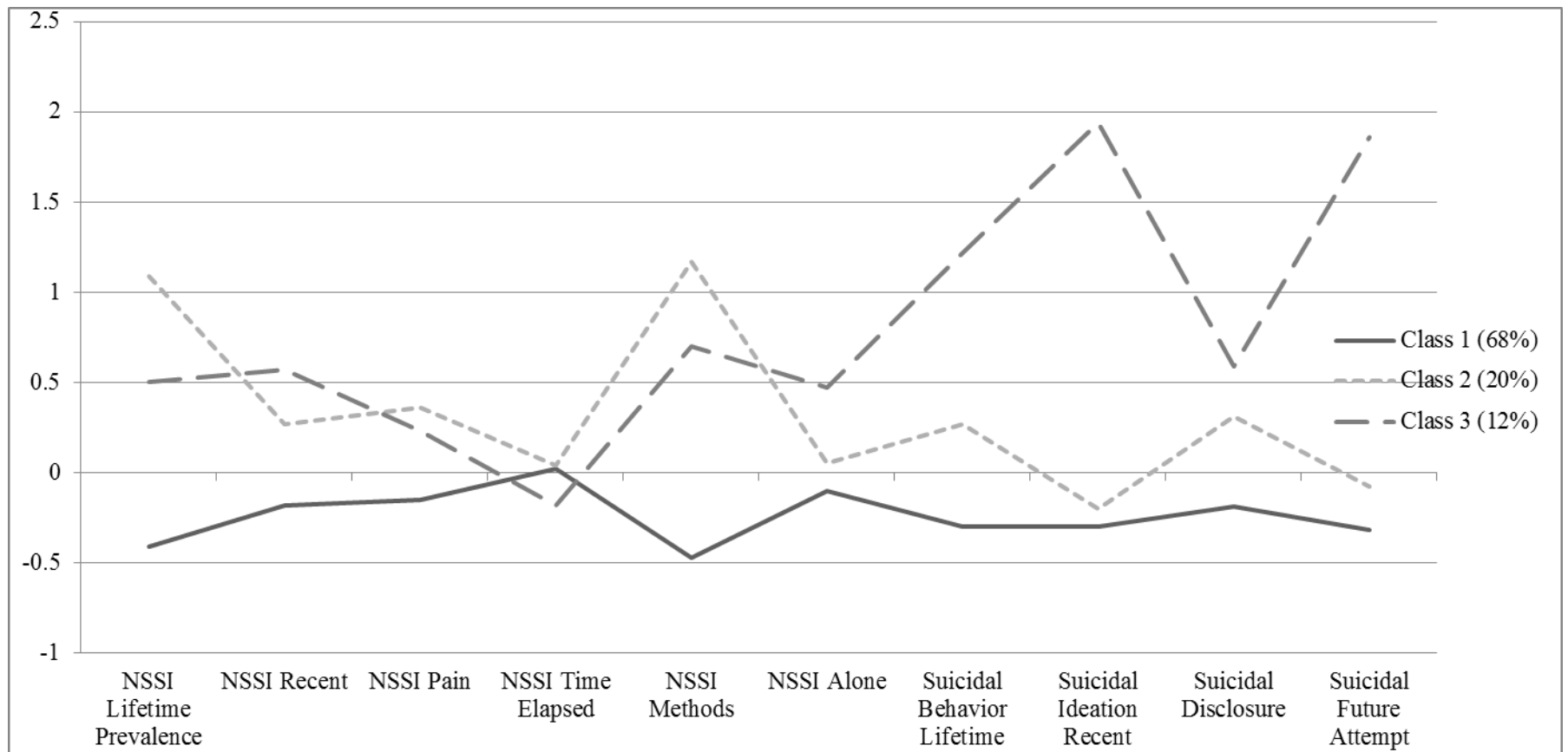


Figure 3-1. *Standardized means of latent classes on class indicators*

Note: Higher scores indicate higher frequency of engagement in NSSI, more recent NSSI, greater pain during NSSI, greater time elapsed between urge to self-injure and act of NSSI, greater number of methods of NSSI, more likely to be alone when engaging in NSSI, more lifetime suicidal ideation/attempts, greater past year suicidal ideation, greater disclosure about suicidal behavior, and more likely to make a future suicidal attempt.

Chapter 4 (Study 3): A laboratory examination of pain threshold and tolerance among nonsuicidal self-injurers with and without self-punishing motivations⁴

Nonsuicidal self-injury refers to behavior that causes direct and deliberate destruction of bodily tissue without lethal intent and includes behaviors such as self-cutting, burning and head-banging (Nock & Favazza, 2009). Recent estimates indicate that as many as 30 to 40% of adolescents and 21% of adults in clinical care engage in NSSI (Briere & Gil, 1998; Darche, 1990; Jacobson, Muehlenkamp, Miller, & Turner, 2008). NSSI also occurs amongst community-based samples, as 13 to 38% of adolescents and young adults (Brausch & Gutierrez, 2010; Gratz, Conrad, & Roemer, 2002; Ross & Heath, 2002; Sornberger, Heath, Toste & McLouth, 2012; Whitlock et al., 2011) and 4 to 6% of older adults report lifetime histories of NSSI (Briere & Gil, 1998; Klonsky, 2011).

In addition to being a widespread mental health concern, NSSI also is associated with suicidal risk. Indeed, NSSI has been shown to be a strong marker of suicidal ideation and attempts among both clinical and community-based samples (for a review, see Hamza, Stewart & Willoughby, 2012). Recent theory suggests that NSSI may lead to increased risk for suicidal behavior, by habituating individuals to self-inflicted pain over time (Joiner, 2005). Consistent with recent theory, research findings indicate that self-injurers report greater pain thresholds (i.e., length of time until a stimulus becomes painful) and pain tolerances (i.e., length of time until a painful stimulus is

⁴ A version of this chapter has been published. Hamza, C. A., Willoughby, T., & Armiento, J. (2014). A laboratory examination of pain threshold and tolerance among nonsuicidal self-injurers with and without self-punishing motivations. *Archives of Scientific Psychology*, 2, 33-42.

terminated) than non-injurers (Franklin et al., 2012; Hooley, Ho, Slater & Lockshin, 2010; Kemperman, Russ, Clark, Tatsuyuki, Zanine & Harrison, 1997; Russ et al., 1996), and that heightened tolerance to pain is associated with risk for suicidal behavior (Nock, Joiner Jr., Gordon, Lloyd-Richardson, & Prinstein, 2006; Orbach, Mikulincer, King, Cohen & Stein, 1997; St. Germain & Hooley, 2013). Despite increased research on the link between NSSI and pain sensitivity, however, little attention has been given to how self-injurers overcome the instinct to avoid the pain involved in NSSI (e.g., self-cutting, burning, scratching to the point of bleeding; Franklin, Lee, Puzia & Prinstein, 2014). In the present study, we addressed this gap in the literature by examining whether one factor that may influence willingness to tolerance to pain is engaging in NSSI to self-punish (e.g., “I engage in NSSI to punish myself,” “I engage in NSSI to express anger at myself”).

NSSI and Pain

There is mounting evidence that individuals who engage in NSSI report aberrant pain perception relative to non-injurers. For example, several researchers have found that individuals with Borderline Personality Disorder (BPD) who engage in NSSI (up to 60%) report that they do not experience pain when self-injuring (Kemperman et al., 1997; Russ et al., 1996; Russ et al., 1992), and demonstrate decreased sensitivity to pain on lab-based tasks as compared to non-injurers (Bohus et al., 2000; Kemperman et al., 1997; Russ et al., 1992; 1999). Recently, researchers also have started to examine pain sensitivity among self-injuring individuals in non-BPD and community-based samples. In these studies, researchers often have employed NSSI-proxy tasks (e.g., electric shocks, cold-pressor task, pressure pain) to create painful stimulation similar to NSSI, and then asked

participants to indicate when the stimulus becomes painful (i.e., pain threshold), and when the pain has to be terminated (i.e., pain tolerance; Franklin et al., 2012; Franklin, Hessel & Prinstein, 2011; Hooley et al., 2010; McCoy, Fremouw & McNeil, 2010; St. Germain & Hooley, 2013).

In one study, McCoy et al. (2010) examined whether self-injuring young adults from a university population could be differentiated from non-injurers on pain measures (i.e., threshold and tolerance) using the algometer pressure device (i.e., a measure which applies increasing focal pressure directly to the skin). Although the two groups did not differ in pain threshold, self-injurers tolerated pain significantly longer than non-injurers, leading the researchers to conclude that self-injury may be more strongly associated with pain tolerance than threshold. Importantly, the link between NSSI and pain tolerance remained even when controlling for anxiety, depressive symptoms, dissociative experiences, and hopelessness. Similarly, Franklin et al. (2012) found that self-injurers had higher pain thresholds and tolerances than non-injurers during a Cold-Pressor Task, and rated this pain as less intense than non-injurers (also see Franklin et al., 2011). Although the link between NSSI and pain tolerance was partially mediated by emotion dysregulation (i.e., emotionally dysregulated individuals tolerated pain longer), NSSI still directly accounted for variance in tolerance to pain, suggesting that differences in pain sensitivity between self-injurers and non-injurers cannot be attributed entirely to differences in emotion regulation capacities. Finally, Hooley et al. (2010) also found that self-injurers had decreased sensitivity to pain (i.e., higher pain thresholds and endurances) during a pressure algometer pain task, relative to non-injurers, in their study of young adults.

Given findings that NSSI is associated with decreased pain sensitivity, an important question for researchers to address is *why* self-injurers may have higher pain thresholds and tolerances relative to non-injurers. One possibility is that individuals who have decreased pain sensitivity may be more likely to engage in NSSI than individuals with higher sensitivity to pain (Nock, 2010; Hooley et al., 2010). For example, Nock (2010) has suggested that individuals with high pain thresholds and tolerances may be more likely to engage in NSSI because they find the behavior less aversive, as compared to individuals who regard the act as frightening and painful. Inconsistent with this hypothesis, however, Franklin et al. (2011) found that self-injurers did not report more painful and provocative life events (PPEs) such as playing contact sports, getting a tattoo, physical fighting, or jumping from heights, than non-injurers. If individuals with high pain thresholds were more likely engage in painful behaviors, it would be expected that self-injurers should also report more other painful life events than non-injurers.

Alternatively, individuals who engage in NSSI may learn to overcome the instinct to avoid pain. According to Joiner's (2005) Interpersonal Theory of Suicide, individuals who engage in NSSI may become gradually desensitized to pain, which in turn, may lead to increased risk for more lethal forms of self-injury. Joiner proposes that this habituation to pain occurs through opponent processes (Franklin et al., 2011; Joiner, Ribeiro & Silva, 2012). More specifically, opponent process theory suggests that when a stimulus causes an individual to deviate from a state of equilibrium (i.e., primary response), a secondary reaction occurs that serves to return the individual to a state of homeostasis when the stimulus is terminated (i.e., an opponent process; Leknes, Brooks, Wiech & Tracey, 2008; Solomon & Corbit, 1974; Solomon, 1980). Researchers have suggested that an act

of NSSI, therefore, may be reinforced by an opponent process (i.e., relief; Joiner, 2005; Joiner et al., 2012), which is strengthened over time (with increasingly frequent NSSI), while pain sensitivity is decreased.

Although researchers are only beginning to examine opponent process theory empirically, findings for an opponent process explanation are mixed. Inconsistent with opponent process theory, recent research has found that more intense pain does not generally lead to greater relief than less intense pain, and NSSI frequency is not associated with greater pain offset relief (Franklin et al., 2010; Franklin et al., 2013). Moreover, some researchers have found that more frequent and longer engagement in NSSI does not appear to be associated with greater pain thresholds and tolerances (Hamza & Willoughby, 2013; Nock et al., 2006), whereas others have found only partial support (e.g., NSSI frequency was not related to pain threshold, but was associated with greater pain endurance; Germain & Hooley, 2013). Nevertheless, researchers have found that self-injurers report greater pain thresholds and tolerances relative to non-injurers (Franklin et al., 2012; Hooley et al., 2010), that self-injurers report decreased negative affect following NSSI (Armey, Crowther & Miller, 2011; Bresin & Gordon, 2013; Russ et al., 1992; Weinberg & Klonsky, 2012), and that heightened pain tolerance is associated with suicidal risk (Nock et al., 2006; Orbach et al., 1997).

Few researchers have examined the process through which the instinct to overcome pain among self-injurers may be diminished. In their study on the link between NSSI and sensitivity to pain, Hooley et al. (2010) observed that during interviews with self-injurers, participants often expressed highly self-critical attitudes toward themselves (e.g., when others criticize me, they must be right; making mistakes is intolerable).

Hooley et al. proposed, therefore, that individuals who hold more negative attitudes toward themselves may tolerate pain longer because they perceive that they are more deserving of pain. To test this hypothesis, Hooley et al. examined whether a measure of self-criticism derived post hoc from other measures (i.e., self-rating scale) predicted pain sensitivity. Although self-criticism did not predict pain threshold, self-criticism was positively associated with higher levels of pain tolerance, leading Hooley et al. to conclude that individuals who hold negative attitudes toward themselves may be more willing to tolerate pain than individuals with more positive attitudes toward themselves. In further support of this contention, in a recent study Hooley et al. (2013) demonstrated that a brief intervention designed to improve attitudes about self-worth (i.e., a focus on positive personal attributes), decreased the amount of time self-injurers tolerated painful stimulation in lab-based task (i.e., pressure algometer).

Although Hooley et al.'s (2010) findings suggest that individuals who hold self-critical beliefs may have diminished sensitivity to pain, a more direct factor that may influence self-injurers willingness to tolerate pain may be the extent to which they desire to self-punish. More specifically, although self-punishment motivations for engagement in NSSI are commonly reported among self-injurers (Briere & Gil, 1998; Laye-Gindhu & Schonert-Reichl, 2005; Nock & Prinstein, 2004; Klonsky & Glenn, 2009), no previous research has examined whether self-injuring to self-punish is a specific risk factor for heightened pain threshold or tolerance among self-injurers. In theory, if an individual's intent is to self-punish, the administration of pain may be an effective way to regulate this need. For example, Nock (2010) suggested that NSSI is a seemingly quick and useful way to degrade one's self, given that NSSI is an immediate and direct form of self-abuse.

Consistent with this hypothesis, researchers have found that individuals who experience the need to self-punish are more likely to choose NSSI, as compared to other behaviors, to specifically regulate this need (Hamza, Willoughby & Good, 2013). Individuals who engage in NSSI to self-punish, therefore, may be more able (and more willing) to tolerate pain, as compared to individuals who engage in NSSI but are not motivated to self-punish. To our knowledge, however, no previous research has tested this hypothesis, or explored individual differences in pain threshold and tolerance among self-injuring groups. Importantly, conducting this research may provide new insight into the processes through which individuals overcome the instinct to avoid pain, and can serve to inform theory on NSSI and pain (e.g., Joiner's theory).

The Present Study

In the present study, we extended previous research on NSSI and pain sensitivity to pain by testing the hypothesis that self-punishment motivations for NSSI engagement are associated with increased pain threshold and tolerance. To test this hypothesis, we examined differences in pain threshold and tolerance among three groups: 1) a group of self-injurers who engaged in NSSI to regulate the need to self-punish 2) a comparison group of self-injurers who engaged in NSSI but not to regulate the need to self-punish and 3) a comparison group of non-injurers matched to the self-injury groups on age, sex, and level of parental education. We expected that individuals who engaged in NSSI to self-punish would be more willing to tolerate pain, and thus would demonstrate increased pain thresholds and tolerances relative to self-injurers without self-punishment motivations, and non-injurers.

In addition, we also extended the previous literature in several other important ways. First, much of the research on sensitivity to pain has been among clinical samples, particularly individuals with BPD. Given the widespread prevalence of NSSI among community-based samples, particularly young adults (Brausch & Gutierrez, 2010; Gratz et al. 2002; Klonsky & Glenn, 2009; Whitlock et al., 2011), understanding the link between NSSI and sensitivity to pain in young adults represents an important area of research inquiry. Thus, we surveyed a sample of young adults enrolled at an undergraduate institution. Second, there is extensive evidence that NSSI typically occurs in the context of negative emotional states. Indeed, several studies have found that NSSI is preceded by an increase in negative emotions such as stress, anger, and frustration (Armey et al., 2011; Muehlenkamp et al, 2009; Nock, Prinstein & Sterba, 2010; See Klonsky, 2009 for a review). Although research consistently demonstrates that NSSI occurs in the context of negative emotions (Armey et al., 2011; Nock et al., 2010), researchers often have examined sensitivity to pain among self-injurers in neutral mood state conditions (Hooley et al., 2010; McCoy et al., 2010; St. Germain & Hooley, 2013). To best emulate the conditions under which NSSI would typically occur, and to increase the ecological validity of our experiment, in the present study we used a commonly used measure of stress induction prior to administering the cold pain task (see Franklin et al., 2011; Franklin et al., 2013). Our study, therefore, seeks to examine differences in pain threshold and tolerance among self-injurers under conditions of distress, as would typically occur during NSSI engagement (Armey et al., 2011; Bresin & Gordon, 2013; Franklin et al., 2011). Third, research using laboratory-based assessments of pain threshold and tolerance are limited, and often rely on the use of small samples of self-

injurers. In addition, researchers often have included self-injurers on the basis of lifetime engagement in NSSI, but recent advances in the assessment of NSSI suggest that past year NSSI engagement may a more appropriate way to characterize self-injurers (American Psychiatric Association, 2013). To address these gaps in the literature, we recruited a large sample of self-injurers who were screened for past year engagement in NSSI, and assessed pain threshold and tolerance, as well as self-reported pain intensity, using a laboratory pain task. Finally, given that emotion dysregulation, self-criticism and prior painful life events may be associated with whether an individual is willing to tolerate pain (Franklin et al., 2012; Hooley et al., 2010), we examined group differences on these measures to determine if the link between self-punishment and pain sensitivity was maintained, even after controlling for these factors.

Methods

Participants

Participants were 82 fourth year undergraduate students at a mid-sized Canadian university (69.5% female; $M_{\text{age}} = 21.52$) recruited from a larger ongoing project examining stress and coping among university students ($N = 1153$). In total, 87.5% of the participants from this original were born in Canada. Consistent with the broader demographics of the region (Statistics Canada, 2006), the most common ethnic backgrounds reported other than Canadian were British (19%), Italian (16.8%), French (9.5%) and German (9%) Data on socioeconomic status indicated mean levels of education for mothers and fathers falling between “some college, university or apprenticeship program” and “completed a college/ apprenticeship/ technical diploma.”

Furthermore, 15% of respondents lived at home with one or both parents, 9% lived off-campus with roommates, and 76% lived in campus residences.

Procedure

Screening and Recruitment: Participants completed the Inventory of Statements about Self-Injury (ISAS; Klonsky & Glenn, 2009), which included assessments of past year NSSI engagement and motivations for engaging in NSSI (e.g., when I self-injured, I was punishing myself) as part of a larger research project (N= 832). Participants who reported a history of NSSI within the past year (N = 40 with self-punishment motivations, 35 without self-punishment motivations) and a sample of non-injuring participants, matched on age, sex, and parental education (N = 34) were invited to participate in a lab-based study. Of those participants who met the study inclusion criteria, 31 (78%) self-injurers with self-punishment motivations agreed to participate, 25 (71%) self-injurers without self-punishment motivations agreed to participant, and 26 (76%) non-injuring participants agreed to participate in the present study.

Experiment procedure. After providing informed consent, participants were asked to self-report on the extent to which they felt relaxed. Participants then completed a stress-inducing speech task. After participants completed the stress task, participants again were asked to indicate the extent to which they felt relaxed. To measure pain threshold and tolerance, participants then completed the Cold-Pressor Task (CPT). After the CPT, participants were asked to complete a short booklet of questionnaires, which included the basic demographic questionnaire, the Difficulties with Emotion Regulation Scale (DERS, Gratz & Roemer, 2004), the Painful and Provocative Experiences Scale (PPE, Bender et al., 2011) and the Self-Criticism Scale (DEQ, Blatt et al., 1976).

Participants were given a full debriefing at the end of the study, and given a list of contact information for several available local mental resources. The study was approved by the University Ethics Board prior to study administration and all participants provided informed active consent before participation. The survey was administered by trained research personal who were specifically trained in handling distressed participants (no participants became distressed during survey administration, however). Students were given \$30 to complete the experiment.

Measures

Demographics. Age and sex (1 = male, 2 = female) were assessed at the time of experiment. SES and ethnicity were assessed at time of screening.

Nonsuicidal Self-Injury. Participants completed the Inventory of Statements about Self-injury (ISAS, Klonsky & Glenn, 2009), which required participants to indicate their frequency of engagement in eight self-injurious behaviors within the past year, without lethal intent (i.e., cutting, burning and head banging). A normalized measure of NSSI frequency was created by collapsing participants' responses into six categories: incident, 2-4 incidents, 5-10 incidents, 11-50 incidents, 51-100 incidents, more than 100 incidents (see Hamza & Willoughby, 2013; Heath et al., 2008 for a similar categorization). Participants who reported a lifetime history of NSSI were also were asked to indicate whether they experienced physical pain while self-injuring, the amount of time elapsed between the urge to self-injure and the act of NSSI (i.e., 1 = less than one hour to 6 = more than 1 day), whether they self-injured alone, and whether they wanted to stop self-injuring. In addition, participants who endorsed a history of NSSI indicated the extent to which 19 statements assessing their motivations for engaging in NSSI (i.e.,

affect regulation, self-punishment, interpersonal boundaries, mark distress, interpersonal influence, peer bonding) applied to them on a scale of 1 (not at all relevant) to 3 (very relevant). The ISAS has been shown to have good internal consistency and construct validity in previous research (Glenn & Klonsky, 2009; Glenn & Klonsky, 2011). Based on their responses on the ISAS participants were grouped into three subgroups.

Participants who engaged in NSSI, and endorsed engaging in NSSI to self-punish (i.e., self-punishment was somewhat to very relevant) were included in the NSSI + self-punish group. Participants who engaged in NSSI, but who indicated that they did not engage in NSSI to self-punish (i.e., self-punishment was not at all relevant) were grouped into the NSSI + no punish group. Participants who did not engage in NSSI formed the comparison group of non-injurers.

Stress Task. To induce stress prior to the administration of the pain task, we utilized Franklin et al.'s 2012 procedure (also see Franklin et al., 2011), which is an adapted version of the Trier Social Stress Test (Kirschbaum, Pirke & Hellhammer, 1993). Participants were given four minutes to prepare a short speech (1 minute) about whether the government should enforce the death penalty. Participants performed their one minute speech in front of a video camera, and their live image was displayed and recorded on a small television screen. Participants were told that their speech would be later shown to a group of their peers, who would evaluate the participant's quality of arguments and the participant's ability to articulate these arguments.

Manipulation check. To ensure participants were stressed prior to engaging in the cold-pressor task, participants were asked to indicate the extent to which they felt

relaxed in the current moment on a scale of 1 (very slightly or not at all) to 5 (extremely) before and after the stress task.

Cold-Pressor Task. The cold-pressor task is one of the most widely used forms of experimental pain induction (see Bohus et al., 2000, Franklin et al., 2012; Franklin et al., 2011; Gratz et al., 2011; Hollin and Derbyshire, 2009; Russ et al., 1992; Russ, Campbell, Kakuma, Harrison & Zanine, 1999). Participants submerged their non-dominant hand up to the wrist into a cold water basin maintained at three degrees Celsius. The temperature used in this study is consistent with other studies using cold-pain (e.g., 1-4 degrees Celsius, Gratz et al., 2011; Hollin & Derbyshire, 2009; Franklin et al., 2011, 2012). Water temperature was maintained by an external cold water chiller, which circulated water in and out of the water basin. Participants were instructed to indicate the point at which the water became painful, but still tolerable, by pressing a yellow button (i.e., pain threshold). Participants also were instructed to press a red button when the water became too painful for them to keep their hand submerged, and to remove their hand from the water (i.e., pain tolerance). Participants also were asked to rate the pain intensity on a scale from 1 (not at all painful) to 10 (extremely painful) when they pressed the yellow button and when they pressed the red button (i.e., intensity at threshold and tolerance, respectively; Franklin et al., 2012; Weinberg and Klonsky, 2012). Stop watches were used to record the time in seconds from start to pain threshold and tolerance. Participants were asked to remove their hand from the water if they reached the maximum time of two minutes.

Difficulties with Emotion Regulation. Participants completed the Difficulties with Emotion Regulation Scale (DERS, Gratz & Roemer, 2004), which required

participants to indicate the extent to which they agreed with 36 statements (e.g., when I'm upset, I have difficulty concentrating) on a scale from 1 (not at all like me) to 5 (completely like me). The DERS has been shown to have good internal consistency and discriminant validity among university students (Gratz & Roemer, 2004; Weinberg & Klonsky, 2009). The Cronbach's alpha was .94.

Painful and Provocative Experiences. Participants completed 25 items assessing the number of painful and provocative events that they have experienced (e.g., played contact sports, got a piercing, sky dived, physical/sexual abuse) using the Painful and Provocative Experiences Scale (PPE; Bender, Gordon, Bresin & Joiner, 2011). Participants responded on a scale from 1 (never) to 5 (more than 20 times). The PPE has been used in other research to assess exposure to painful life situations (Franklin et al., 2011; Joiner et al., 2007).

Self-Criticism. Self-Criticism was assessed using the 12 item Self-Criticism Subscale from the Depressive Experiences Questionnaire (DEQ, Blatt, D'Affliti, & Quinlan, 1976). Participants were asked to what extent they agree with statements (e.g., I tend to be very critical of myself) on a scale from 1 (strongly disagree) to 7 (strongly agree). The Self-Criticism Subscale of the Depressive Experiences Scale was designed to assess self-criticism among college students (e.g., perceived failure to live up to one's expectations and standards), and is one of the most widely used measures of self-criticism among young adults to date. Among college students, the measures has demonstrated strong construct validity (Blatt et al., 1976; Mongrain & Zuroff, 1995; Zuroff & Mongrain, 1987) and internal consistency (Zuroff, Moskowitz, Wielgus, Powers & Franko, 1983). The Cronbach's alpha for the scale was .87.

Results

Preliminary Analyses

Correlations among the study measures are presented in Table 4-1. Means and standard deviations for the pain measures are presented in Table 4-2. Of the 56 participants with a history of NSSI, 1 participant engaged in NSSI once within the past year (2%), 9 participants engaged in NSSI 2-4 times within the past year (16%), 9 participants engaged in NSSI 5-10 times (16%), 21 participants engaged in NSSI engaged in NSSI 11-50 times within the past year (37%), 5 engaged in NSSI 51-100 times within the past year (9%) and 11 engaged in NSSI 100 or more times (20%). The most commonly occurring types of self-injury included self-pinching, self-hitting, and head banging. The NSSI groups (NSSI + punish, NSSI + no punish) did not significantly differ on age, sex, NSSI characteristics (i.e., frequency of NSSI, pain experienced during NSSI, whether they were alone while injuring, or whether they wanted to stop self-injury), or motivations for self-injuring (other than self-punishment, all $ps > 0.05$).

Primary Analyses

For the primary analyses, non-normal variables (i.e., pain threshold, pain tolerance, and pain intensity at tolerance) were transformed using visual binning. Visual binning is preferable to recoding variables, in order to collapse several values into fewer data points containing a similar number of cases (see Griffith, 2007; Pollock III, 2011). ANOVAs indicated that there was a main effect of group membership on emotion regulation, $F(2, 79) = 14.93, p < 0.01$, partial $\eta^2 = .27$, and self-criticism, $F(2, 79) = 14.17, p < 0.01$, partial $\eta^2 = .26$. For the post-hoc analyses, all possible mean comparisons among the 3 groups were conducted using Fisher's Least Significant Difference Tests

(LSD). The LSD test provides added power while ensuring that the familywise error rate remains equal to alpha when making comparisons amongst three means (Field, 2009; Howell, 2010). Compared to the group of non-injurers, self-injurers reported significantly higher levels of emotional dysregulation, but the self-injury groups did not significantly differ from each other ($M = 2.67$ for NSSI + punish, $M = 2.40$ for NSSI + no punish, and $M = 1.93$ for non-injurers). In addition, both self-injuring groups reported significantly higher levels of self-criticism than non-injurers, and the NSSI + self-punish group reported higher levels of self-criticism than NSSI + no punish group ($M = 4.71$ for NSSI + punish, $M = 4.08$ for NSSI + no punish, and $M = 3.46$ for non-injurers). All three groups (i.e., NSSI + punish, NSSI + no punish, non-injurers) did not significantly differ on the painful life events measure (which included questions about physical and sexual abuse).

Manipulation check

As expected, a repeated-measures analysis revealed that all groups (i.e., NSSI + punish, NSSI + no punish, non-injurers) were significantly less relaxed following the stress task $F(1, 79) = 108.04, p < 0.01$, partial $\eta^2 = .578$ ($M = 3.30$ pre-stress, and $M = 2.03$ post-stress). There was no significant group by time interaction ($p > 0.05$), suggesting that all groups showed similar decreases in ratings of relaxation pre and post-stress task.

Pain Threshold

An ANOVA was used to examine mean differences in pain threshold (i.e., the point at which the cold water became painful) among the three groups (i.e., NSSI + punish, NSSI + no punish, control). There was a main effect of group membership on

pain threshold, $F(2, 79) = 3.192, p = 0.046$, partial $\eta^2 = 0.075$. Post hoc analyses indicated that NSSI + self-punish group reported significantly greater pain threshold than the control group ($M = 30.97$ for NSSI + punish, $M = 15.29$ for non-injurers). The NSSI + no punish group ($M = 19.31$) did not significantly differ from the NSSI + punish group, or the non-injurers. Groups did not significantly differ in self-reported pain intensity at threshold ($p > 0.05$).

Pain Tolerance

An ANOVA analysis was used to examine mean differences in pain tolerance (i.e., the point at which participants removed their hand from the cold-water) among the three groups (i.e., NSSI + punish, NSSI + no punish, control). Groups significantly differed on pain tolerance, $F(2, 79) = 5.382, p < 0.01$, partial $\eta^2 = 0.12$. Post hoc analyses revealed that the NSSI + punish group had a significantly higher pain tolerance than the NSSI + no punish group, and the comparison group of non-injurers. The NSSI + no punish group and the non-injuring group did not significantly differ ($M = 60.78$ for NSSI + punish, $M = 40.54$ for NSSI + no punish, $M = 38.02$ for non-injurers). Groups also significantly differed on pain intensity at tolerance, $F(2, 79) = 5.451, p < 0.01$, partial $\eta^2 = 0.12$. Since the assumption of homogeneity of variance was violated for this analysis, Games-Howell follow up analyses were used. The NSSI + punish group rated their pain intensity at tolerance as significantly less than the NSSI + no punish group and the non-injuring group, while the NSSI + no punish and non-injurers did not significantly differ ($M = 7.63$ for NSSI + punish, $M = 8.88$ for NSSI + no punish, $M = 8.88$ for non-injurers; see Table 4-2).

Self-criticism, self-punishment, and pain measures

Given that the two self-injury groups only differed on the self-criticism measure, we examined whether the link between self-punishment and the pain measures was maintained even after taking into account differences in self-criticism among self-injurers using regression analyses (results are presented in Table 4-3). In the first hierarchical regression analysis, self-criticism was regressed onto pain threshold on step one, and group status (NSSI + punish, NSSI + no punish) was regressed onto pain threshold on step two. With the inclusion of self-criticism, differences in pain threshold were no longer significant ($ps < 0.05$). In the second hierarchical regression analysis, self-criticism was regressed onto pain tolerance on step one, and group status (NSSI + punish, NSSI + no punish) was regressed onto pain tolerance on step two. After statistically controlling for self-criticism, group membership still predicted pain tolerance $t(53) = 3.06, p < 0.05$. In the third hierarchical regression analysis, self-criticism was regressed onto pain intensity at tolerance on step one, and group status (NSSI + punish, NSSI + no punish) was regressed onto pain intensity at tolerance on step two. After statistically controlling for self-criticism, group membership still predicted pain intensity at tolerance $t(53) = -2.71, p < 0.05$.

Discussion

Recent research indicates that individuals who engage in NSSI report greater pain thresholds and tolerances relative to non-injurers. Despite increased research on the link between NSSI and pain sensitivity, however, little attention has been given to how self-injurers overcome the instinct to avoid the pain involved in NSSI. In the present study, we addressed this gap in the literature by examining whether one factor that may influence a self-injurer's willingness to tolerate pain is whether they engage in NSSI to

regulate the need to self-punish. Consistent with study predictions, self-injurers who engaged in NSSI to regulate the need to self-punish tolerated pain significantly longer and rated this pain as less intense than self-injurers who did not self-punish and a comparison group of non-injurers. Our findings suggest that engaging in NSSI to self-punish, in particular, may be associated with willingness to tolerate pain. Moreover, our findings suggest that motivational factors underlying NSSI should be integrated into theories on the link between NSSI and tolerance to pain.

We expected that self-punishing motivations for engaging in NSSI would be associated with heightened pain tolerance among self-injurers, given that causing oneself to tolerate pain may be an effective way to regulate the need to self-punish (see Nock et al., 2010 for a similar discussion). Consistent with this prediction, although both self-injury groups experienced pain at the same time (i.e., no difference on pain threshold; pain intensity at threshold), self-injurers with self-punishing motivations tolerated this pain significantly longer than self-injurers without self-punishing motivations (and a comparison group of non-injurers). Thus, our findings suggest that tolerating painful stimulation may be an important part of the self-injury experience among individuals who engage in NSSI to self-punish (because self-inflicted pain may serve an important function in regulating the need to self-punish). Moreover, our results suggest that engaging in NSSI to specifically regulate the need to self-punish may lead to pain desensitization over time. Indeed, self-injurers who engaged in NSSI to self-punish not only withstood the pain longer than the other two groups, they also found this pain less aversive than self-injurers without self-punishing motivations and non-injurers (i.e., pain desensitization). Van Orden, Witte, Gordon, Bender, & Joiner (2008) have suggested that

NSSI may affect an individual's tolerance for pain by influencing the individual's cognitive appraisal of whether painful self-directed injury will be bearable. Our study indicates, therefore, that self-injurers may learn to overcome the instinct to avoid the pain inherent in NSSI through practice in tolerating pain (i.e., self-injuring to self-punish).

Our finding that individuals who engaged in NSSI specifically to regulate the need to self-punish differed from the other two groups (i.e., NSSI + no punish, non-injurers) on measures of pain tolerance and pain intensity at tolerance has important implications for Joiner's (2005) theory. Recall that Joiner proposed that individuals who engage in NSSI gradually become desensitized to pain, because the affective gains of NSSI are strengthened over time while the primary response of pain is diminished through opponent processes (Joiner, 2005; Joiner et al., 2012). On the basis of Joiner's theory, we might expect that self-injuring groups (regardless of motivations for engaging in NSSI) would show increased pain thresholds and tolerances on the cold-pressor task relative to non-injurers if repetitive engagement in NSSI diminished pain perception over time. Only self-injurers who engaged in NSSI to regulate the need to self-punish, however, show decreased sensitivity to pain as compared to non-injurers (note that both self-injury groups did not differ even on measures of NSSI frequency). Clearly then, repetitive engagement in NSSI alone was not sufficient to produce heightened pain tolerance, as would be expected by opponent process theory. Our findings, however, are consistent with Joiner's central notion that NSSI may desensitize individuals to self-inflicted pain over time, and suggest that one important motivational factor that may contribute to an individual's willingness to tolerate pain, is self-punishment (likely through altering one's cognitive appraisal of whether one can or should endure pain). Our

findings support intervention programming (such as that of Hooley et al., 2013), that suggest that targeting individuals' self-perceptions may help reduce NSSI engagement.

That self-punishment may be an important marker of pain tolerance is further strengthened by our finding that self-injury groups did not significantly differ on *any* other measures of NSSI characteristics (e.g., frequency of engagement in the past year, time elapsed between urge and act, desire to stop self-injuring). Moreover, the two self-injury groups did not differ on whether they reported experiencing pain during NSSI, which has been shown to be associated with sensitivity to pain on laboratory tasks among individuals with BPD (Bohus et al., 2001; Kemberman et al., 1997; Russ et al., 1992; 1999). Groups also did not differ on measures of emotion dysregulation or painful life events, suggesting that the link between self-punishment and pain tolerance is not accounted for by these factors (also see Franklin et al., 2011; 2012). Finally, although the self-punishment group reported greater self-criticism than the no punishment group, we found that the link between self-punishment and NSSI was maintained even after taking into account measures of self-criticism. Although self-criticism and self-punishment are likely conceptually similar, our findings suggest that self-punishment may be a more proximal predictor of pain tolerance and self-criticism. Future research, however, could further disentangle associations among self-criticism, self-punishment, and pain tolerance.

Future research should examine the link between self-punishment motivations for NSSI and risk for suicidal behavior. Recent research consistently has shown that NSSI is a robust predictor of suicidal behavior (Asarnow et al., 2011; Klonsky, May & Glenn, 2013; Guan et al., 2012; Whitlock et al., 2013; Wilkinson et al., 2011), and several

researchers have reported that a heightened threshold for pain increases an individual's risk for suicidal behavior (Nock et al., 2006; Orbach et al., 1997; St. Germain & Hooley, 2013). If individuals who engage in NSSI are at increased risk for the development of heightened tolerances to pain, these individuals also may be at increased risk for suicidal behavior. Future research, therefore, should examine whether self-punishment motivations for NSSI are associated with increased risk for suicidal behavior through increased tolerance to pain (i.e., mediational model).

Another important avenue for future research will be to address how self-punishing motivations for NSSI engagement develop among self-injurers. The link between NSSI and early exposure to aversive family environments has been widely documented (Briere & Gil, 1998; Bolen, Winter & Hodges, 2013; Glassman, Weierich, Hooley, Deliberto, & Nock, 2007). Some researchers have proposed that early exposure to invalidating family environments (e.g., neglect, physical or sexual abuse) may lead to increased self-criticism, which in turn leads to self-directed abuse, such as NSSI (Glassman et al., 2007; Linehan, 1993; Wedig & Nock, 2007). It is interesting to note, however, that we found that the link between self-punishment motivations for NSSI and pain tolerance was maintained even after taking into account self-criticism. Moreover, self-criticism was not correlated with any of the pain measures in the present study. Our findings suggest, therefore, that the development of self-punishment motivations may a more important developmental pathway to explore in future research. Interestingly, we did not find any differences between our two self-injury groups on exposure to abuse histories. Our findings suggest, therefore, that abuse history may not necessarily lead to self-punishment motivations for NSSI engagement. A critical extension for future

research, therefore, will be to examine the correlates, as well as the development of self-punishment motivations over time.

Limitations

Although the present study has many strengths, including a focus on an unexplored risk factor for pain threshold and tolerance (i.e., self-punishment motivations), the use of a relatively large sample of non-clinical self-injurers with past year NSSI engagement, and the assessment of pain using both lab and self-report measures, our study has several significant limitations. First, given the concurrent design on the present study, we cannot be certain about the directionality of effects. Although recent theory and research suggests that NSSI may lead to decreased sensitivity to pain (Joiner, 2005; Joiner et al., 2012; Franklin et al., 2011), we could not directly test whether self-punishment motivations facilitate pain tolerance, or whether individuals with higher pain tolerances are more likely to engage in NSSI to self-punish. Longitudinal research is necessary to explicitly test bidirectional associations among an NSSI and sensitivity to pain over time. We did find, however, that self-injurers (including those with self-punishment motivations) did not report more painful life events than non-injurers (e.g., combat sports, getting a tattoo). Presumably if individuals with high tolerances for pain sought out painful life events, we would expect our self-injurers to report a greater frequency of painful life events. Regardless, to our knowledge, our study offers the first examination of the link between self-punishment and tolerance to pain, and can serve to inform future longitudinal research in this area.

Second, although the present sample was drawn from a large sample representative of a particular university in Canada, the majority of the participants

enrolled in the study were of western descent and born in Canada; therefore, our findings may not generalize to other geographic regions, including those with differing ethnic and/or demographic backgrounds. Furthermore, our study specifically sampled fourth-year university students and therefore may not be generalizable to the wider student population (i.e., lower year students) or young adults not attending university. Moreover, although we specifically sampled students who reported past year engagement in NSSI as outlined in the new *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (American Psychiatric Association, 2013), it is unclear whether our results would be comparable among clinical samples, who engage in more frequent and severe NSSI. Thus, although our results offer a preliminary examination of the association between self-punishment motivations and tolerance to pain, future research could serve to replicate findings using non-clinical samples, as well as specifically examine the link between self-punishment orientations and tolerance to pain in more diverse samples (e.g., different ethnicities, clinical groups).

Another potential limitation of the present work that is important to acknowledge is that group differences in the study measures could be attributed to differences in other unmeasured factors. For example, Hooley et al. (2010) found that individuals who self-injured scored higher on a dissociative symptoms scale (e.g., assessing disturbances in memory, cognition, and identity) relative to non-injurers. It is possible, therefore, that other third variables also may contribute to differences in pain measures identified in the present study. To reduce the influence of third variables, however, our self-injury groups were matched on age and sex, and we also found self-injurers did not differ on NSSI characteristics (i.e., frequency of engagement, the experience of pain during NSSI,

whether the individual is alone when self-injuring, time elapsed between urge and act, and desire to stop), NSSI motivations, emotion dysregulation, and painful life events. Importantly, associations between self-punishment and tolerance were maintained, even after taking into account other factors that have been implicated in pain threshold and tolerance (Franklin et al., 2011; 2012; Hooley et al., 2010). Nevertheless, future research should explore possible third variables, which may contribute to differences in pain tolerance between self-injurers with and without self-punishing motivations, as well as non-injurers (e.g., dissociative symptoms, depressive symptoms).

Finally, as has been noted by other researchers, it is difficult to determine whether the pain experienced during the cold-pressor task is similar to the pain that may be experienced during NSSI. Although the cold-pressor task has been used in previous research on self-injury (Bohus et al., 2000, Franklin et al., 2012; Franklin et al., 2011; Gratz et al., 2011; Russ et al., 1992, 1999), is unclear to what extent this pain maps onto actual NSSI engagement. Nevertheless, we chose a very cold water temperature (three degrees Celsius), which Franklin et al. (2011; 2012) suggested might best create the quick and immediate pain produced by an episode of NSSI. Moreover, since research has demonstrated that NSSI consistently occurs in the context of negative mood states (Armey et al., 2011; Bresin & Gordon, 2013; Franklin et al., 2010), we included a stress task prior to engagement in the cold pain task to best recreate the conditions of NSSI engagement occurs. Future research, however, should explore whether perception to pain varies depending on whether pain occurs in the context of distress.

Conclusions:

Despite increased research on the link between NSSI and sensitivity to pain in recent years (McCoy et al., 2010; Franklin et al., 2012), little attention has been given to which self-injurers may be most able (or willing) to tolerate pain. In the present study, we examined whether individuals who engaged in NSSI specifically to regulate the need to self-punish demonstrated heightened pain thresholds and tolerances relative to self-injurers without self-punishing motivations and a comparison group of non-injurers. Consistent with expectations, individuals who engaged in NSSI to self-punish had greater pain tolerances, and rated this pain as less intense, than the other two groups. To our knowledge, our findings are the first to provide empirical evidence that tolerating painful stimulation may be an important part of the self-injury experience among individuals who engage in NSSI to self-punish. Specifically, these individuals may be particularly motivated to tolerate the pain involved in NSSI as a way to self-punish. Importantly, self-injurers who endorse self-punishment motivations for engaging in NSSI should be targeted by future prevention and intervention efforts, as increased tolerance for pain is an important risk factor for suicidal behavior (Nock et al., 2006; Orbach et al., 1997; St. Germain & Hooley, 2013). In addition to replicating findings on the link between self-punishment motivations and pain, future research also should examine the link between self-punishment and risk for suicidal behavior. More specifically, researchers could examine whether engaging in NSSI to self-punish predicts suicidal attempts, indirectly through increased tolerance to pain.

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Table 4-1

Correlation Table

	1	2	3	4	5	6	7	8	9
1. Age	-								
2. Sex	-.03	-							
3. Pain threshold	.16	-.09	-						
4. Pain intensity at threshold	.02	.09	-.15	-					
5. Pain tolerance	.13	-.23*	.74**	-.28*	-				
6. Pain intensity at tolerance	-.12	.09	-.31**	.58**	-.35**	-			
7. DERS	-.22*	-.03	.18	-.02	.24*	-.17	-		
8. Self-criticism	-.16	.05	.13	.09	.13	-.10	.77**	-	
9. PPE	.01	-.26*	.02	-.28*	.24*	-.24*	.12	.01	-

Note. Higher scores indicate higher age, sex (1 = male, 2 = female), greater pain threshold, greater pain intensity at threshold, greater pain tolerance, greater pain intensity at tolerance, higher DERS (i.e., difficulties with emotion regulation), higher self-criticism, and higher scores on the PPE (i.e., painful and provocative life events score). * = $p < 0.05$, ** $p < 0.01$.

Table 4-2

Groups differences on measures of pain sensitivity

	NSSI + punish	NSSI + no punish	Non-injurers
Pain threshold	30.97 (32.54) _b	19.31 (21.73) _{a,b}	15.29 (12.23) _a
Pain intensity at threshold	5.50 (2.01) _a	5.86 (1.62) _a	5.98 (1.45) _a
Pain tolerance	60.78 (42.81) _b	40.54 (29.53) _a	38.02 (27.82) _a
Pain intensity at tolerance	7.63 (2.43) _a	8.88 (0.85) _b	8.88 (1.30) _b

Note. Means in the same row with different subscripts are significantly different at $p < 0.05$. Raw means are shown.

Table 4-3

Regression Analyses

	Variables	B	SE B	β	<i>p</i>
Regression 1 DV = pain threshold					
Step 1:	Self-criticism	.068	.123	.075	.583
Step 2:	Self-criticism	.002	.128	.002	.988
	Group membership	.425	.256	.233	.103
Regression 2 DV = pain tolerance					
Step 1:	Self-criticism	.022	.089	.034	.803
Step 2:	Self-criticism	-.601	.087	-.093	.488
	Group membership	.536	.175	.408	.003
Regression 3 DV = pain intensity at tolerance					
Step 1:	Self-criticism	-.026	.153	-.023	.867
Step 2:	Self-criticism	.103	.152	.091	.503
	Group membership	-.825	.305	-.366	.009

Note. For Regression 1 ($R^2 = .006$, $\Delta R^2 = .049$). For Regression 2, ($R^2 = .001$, $\Delta R^2 = .150$). For Regression 3, ($R^2 = .001$, $\Delta R^2 = .121$). DV = dependent variable.

Chapter 5: General Discussion and Conclusions

Nonsuicidal self-injury (NSSI), which refers to the direct and deliberate destruction of bodily tissue in the absence of lethal intent (American Psychiatric Association, 2013), is a widespread and serious mental health concern (Nock, 2010). Although NSSI has been differentiated from suicidal behavior on the basis of non-lethal intent, there is mounting evidence that NSSI is a risk factor for suicidal ideation and attempts (Andover & Gibb, 2010; Asarnow et al., 2011; Lloyd-Richardson, Perrine, Dierker & Kelley, 2004; Nock, Joiner, Gordon, Lloyd-Richardson & Prinstein, 2006; Tang et al., 2011; Whitlock, Muehlenkamp & Eckenrode, 2008; Whitlock & Knox, 2007; see Hamza, Stewart & Willoughby, 2012 for a review). Despite recent findings, however, researchers are only beginning to understand why NSSI may increase risk for more lethal forms of self-injury. In an effort to elucidate the processes through which NSSI may lead to increased suicidal risk, I examined the associations among psychosocial risk, NSSI, and several measures of suicidal risk (i.e., ideation, attempts, pain tolerance) in three studies. As predicted, NSSI was strongly associated with psychosocial risk and suicidal ideation, as well as ability to enact lethal self-injury (as assessed by measures of tolerance to pain, and suicidal attempts). In addition to providing new insight into the associations among psychosocial risk, NSSI, and suicidal risk, my findings also offer clinicians with several NSSI-specific risk factors (e.g., frequency, number of methods, engaging in NSSI to self-punish) that may serve as important markers of suicidal risk among individuals engaging in NSSI.

Theoretical Framework:

Recall that according to Joiner's Interpersonal Theory of Suicide (2005) in order to end one's own life an individual must not only desire to end his/her own life (i.e., suicidal desire), but also have the capacity to enact lethal self-injury (i.e., acquired capability for suicide; Joiner, Ribeiro, & Silva, 2012; Van Orden, Witte, Gordon, Bender & Joiner, 2008). It has been proposed that the reason NSSI is such a strong predictor of suicidal behavior (over and above these other factors such depressive symptoms, family functioning, BPD, impulsivity, Andover & Gibb, 2010; Asarnow et al., 2011; Klonsky et al., 2013; Whitlock et al., 2013), therefore, is because NSSI is associated with both psychosocial risk (a proxy for suicidal desire) and acquired capability for suicide (Joiner et al., 2012; Klonsky, May & Glenn, 2013). According to Joiner, NSSI leads to increased acquired capability for suicide by habituating individuals to self-inflicted pain over time (unlike other risk factors), via opponent processes. More specifically, the primary response to NSSI (i.e., pain) is thought to diminish over time, while the opponent response (i.e., relief) is thought to increase, resulting in increased pain tolerance among individuals engaging in NSSI (Van Orden et al., 2008). Although Joiner's theory provides one of the first and most comprehensive models to account for the link between NSSI and suicidal behavior, little empirical research testing Joiner's theory has been conducted.

Doctoral Studies:

The primary goal of my doctoral research was to provide new insight into why NSSI may be associated with suicidal risk, by examining associations among psychosocial risk, NSSI, and suicidal risk. In particular, I was interested in identifying individuals who engaged in NSSI who were at risk for suicidal behavior, in an effort to

elucidate the processes through which NSSI may lead to increased suicidal risk. In study one, I examined whether NSSI engagement was associated with increases in psychosocial risk and suicidal ideation over a one year period, as predicted by Joiner (2005; i.e., NSSI is a marker of psychosocial risk). In study two, I examined whether different NSSI characteristics (e.g., frequency, number of methods) were associated with suicidal risk, given that more severe engagement in NSSI should be associated with increased risk if NSSI leads to increased acquired capability for suicide. I also examined whether individuals who engaged in NSSI who were at the greatest risk for suicidal behavior differed from low-risk individuals on measures of psychosocial risk, given that Joiner states individuals require both the desire (which is strongly associated with psychosocial risk) and the ability to enact lethal self-injury. Finally, in study three, I tested whether NSSI was associated with pain threshold and tolerance (which are regarded as markers of acquired capability for suicide in Joiner's theory). To extend Joiner's theory, I also examined whether individuals who engaged in NSSI to self-punish tolerated pain longer than individuals who engaged in NSSI, but not to self-punish.

NSSI and Suicidal Desire

Recent theory and research suggest that individuals who engage in NSSI are at increased psychosocial risk relative to individuals who do not engage in NSSI (Nock, 2010). Indeed, researchers have consistently found that individuals who engage in NSSI report greater emotional dysregulation (Heath, Toste, Nedecheva & Charlebois, 2008; Muehlenkamp, Kerr, Bradley & Larsen, 2010), depressive symptoms and anxiety (Kerr & Muehlenkamp, 2010; Whitlock & Knox, 2007) as well as lower parent and peer relationship quality (Martin, Bureau, Cloutier, Cloutier & Lafontaine, 2011; Heath, Ross,

Toste, Charlebois & Nedechewa, 2009) than individuals who do not engage in NSSI.

Nock (2009) has proposed that psychosocial risk factors may undermine an individual's ability to cope with distress, and thus lead to NSSI. As a result, NSSI may be associated with suicidal behavior, because NSSI is strongly associated with psychosocial risk (which is correlated with suicidal desire; Joiner, 2005; Klonsky et al., 2013). There has been little longitudinal research, however, on NSSI and its associations with psychosocial risk and suicidal desire (operationalized as suicidal ideation; Van Orden et al., 2008).

To address this gap in the literature, I conducted a person-centered longitudinal examination of changes in NSSI engagement from first to second year university among a large sample of young adults in study one. On the basis of Nock's theory (2009), I expected that increasing psychosocial risk would be associated with NSSI engagement over time. Moreover, on the basis of Joiner's theory (2005), I expected that increases in psychosocial risk, and NSSI engagement over time, would be associated with increases in suicidal ideation over time. As predicted, beginners, relapsers, and persistent injurers reported increases in psychosocial risk and suicidal ideation over time, whereas recovered injurers and desisters reported decreases in psychosocial risk and suicidal ideation over time. My findings are consistent with a larger body of literature that indicates that NSSI occurs in the context of high levels of intrapersonal and interpersonal risk (Armey, Crowther & Miller, 2011; Klonsky & Glenn, 2009; Nock & Prinstein, 2004; Nock, 2010), and provide longitudinal evidence that these associations occur over time. Moreover, my findings offer support for the contention that increases in psychosocial risk and NSSI engagement over time, are also strongly associated with increases in suicidal ideation over time. These findings are highly consistent with recent suggestions that NSSI may be

associated with suicidal behavior, in part, because it is associated with the desire to end one's own life (Klonsky et al., 2013; Joiner et al., 2012).

Although my study did not specifically assess direction of effects, it is noteworthy that individuals with a lifetime history of NSSI who were not currently self-injuring at Time 1 but who started self-injuring again at Time 2 (i.e., relapsers) reported higher levels of suicidal ideation than non-injurers at Time 2, but not at Time 1. This finding is consistent with a larger literature that engagement in NSSI may lead to increased engagement in suicidal behavior over time (Asarnow et al., 2011; Prinstein et al., 2008; Wilkinson et al., 2011). Interestingly, however, individuals who started self-injuring for the first time from first to second year of university reported greater suicidal ideation at Time 1 than a non-injuring group, even before they started engaging in NSSI. Although longitudinal research indicates that NSSI primarily is a risk factor for suicidal ideation and attempts (but not the reverse; Asarnow et al., 2001; Wilkinson et al., 2011; Whitlock et al., 2013), the use of a person-centered approach demonstrated that for a minority of individuals, suicidal ideation may actually precede NSSI engagement. Little attention has been given to the anti-suicide function of NSSI (i.e., engaging in NSSI to avoid suicidal behavior; Klonsky & Glenn, 2009); future research should address this gap in the literature.

NSSI and Suicidal Behavior

Recall that Joiner (2005) suggests that NSSI is an especially unique and robust predictor of suicidal behavior (over and above other commonly reported risk factors, including depressive symptoms, hopelessness, family functioning, and PTSD; Andover & Gibb, 2010; Asarnow et al., 2011; Tang et al., 2011; Wilkinson et al., 2011; Whitlock et

al., 2013) because NSSI may actually increase an individual's ability to end his/her own life (i.e., increased acquired capability for suicide). In other words, unlike many other risk factors for suicide (e.g., depressive symptoms), NSSI is not just a marker of suicidal desire, but also a means through which individuals develop acquired capability for suicide (Klonsky, Victor & Saffer, 2014). On the basis of Joiner's theory, therefore, it would be expected that individuals who engage in frequent NSSI would be at greater risk for suicidal behavior than individuals who engage in NSSI infrequently, given that frequent engagement in NSSI should be associated with greater acquired capability for suicide. Little research, however, has specifically examined this prediction.

To test Joiner's theory (2005) empirically, I examined whether variability in NSSI frequency, as well as several other NSSI characteristics (i.e., methods, recency, time spent thinking about the act, painfulness of act, and social context), were associated with degree of suicidal risk among young adults engaging in NSSI in study two. Consistent with Joiner's model, I found that individuals who engaged in frequent NSSI involving multiple methods, were at greater risk than individuals who engaged in NSSI infrequently and a comparison group of non-injurers. More specifically, using latent class analyses I identified three subgroups: 1) an infrequent NSSI/not high risk for suicidal behavior group, 2) a frequent NSSI/not high risk for suicidal behavior group, and 3) a frequent NSSI/high risk for suicidal behavior group. Individuals in the frequent NSSI/high risk for suicidal behavior group met the clinical cutoff score for high suicidal risk (Osman, 2002) and reported significantly greater levels of suicidal ideation, attempts, and risk for future suicidal behavior as compared to the other two groups. It is important to note that individuals in the high risk group were also differentiated from the other groups

(including a comparison group of non-injuring young adults) by higher levels of psychosocial risk. My findings are consistent with Joiner's theory that in order to enact lethal self-injury, an individual must have both the desire (which is correlated with psychosocial risk), and the ability, to enact lethal self-injury. Indeed, individuals who met the clinical cutoff score for high suicidal risk, reported both frequent NSSI engagement (a possible proxy for acquired capability for suicide), as well as high psychosocial risk (a proxy for suicidal desire). My results, therefore, underscore the importance of assessing individual differences in NSSI characteristics, as well as psychosocial risk, when assessing risk for suicidal behavior among individuals engaging in NSSI.

Although Joiner's (2005) theory does not specifically address the social context in which NSSI occurs, it is noteworthy that in study one I found that individuals in the high risk for suicidal behavior group also were differentiated from the other groups by greater self-injuring alone, rather than in the context of peers. Although I did not specifically assess motivations for engaging in NSSI in this study, there is some research to suggest that individuals who self-injure alone may be more likely to endorse intrapersonal motivations for engaging in NSSI (e.g., to regulate anxiety, stress, self-punish), rather than interpersonal motivations (to fit in with others; Glenn and Klonsky, 2009). These findings suggest that clinicians may want to specifically inquire about the social context in which NSSI occurs, as engaging in NSSI to regulate intrapersonal distress alone may be a marker of greater risk for suicidal behavior as compared to engaging in NSSI in the presence of peers.

Given that Joiner (2005) has proposed that NSSI may lead to suicidal behavior by increasing an individual's ability to enact lethal self-injury, in study three I tested Joiner's

theory that NSSI engagement may desensitize individuals to pain (i.e., a component of acquired capability for suicide). More specifically, in study three, a subsample of the original larger sample was invited into the lab to participate in a cold-pain task. On the basis of Joiner's theory, it was expected that individuals who engaged in NSSI would report greater pain tolerances relative to individuals who did not engage in NSSI (Joiner et al., 2012; Nock et al., 2006; Van Orden et al., 2010). To extend Joiner's theory, I also examined whether individuals who engaged in NSSI specifically to regulate the need to self-punish would endure pain longer than individuals who engaged in NSSI but not self-punish, as enduring pain may be an important part of regulating the need to self-punish. Consistent with my hypotheses, self-injurers who engaged in NSSI to self-punish tolerated pain significantly longer and rated this pain as less aversive than self-injurers without self-punishment motivations, and the comparison group of non-injurers.

Theoretical Support and Extensions

My findings have important implications for Joiner's theory (2005; Joiner et al., 2012) on the link between NSSI and suicidal behavior. First, as expected, I found that engagement in NSSI over time was associated with increases in psychosocial risk, as well as increases in suicidal ideation over time. Findings from study one support the contention that NSSI may, in part, be associated with suicidal behavior, because it is a maker of psychosocial risk, and associated with suicidal ideation (Joiner et al., 2012; Klonsky et al., 2013; Klonsky et al., 2014). Also, consistent with Joiner's theory, I found that individuals with a history of NSSI who were most at risk for suicidal behavior were those who engaged in frequent NSSI involving multiple methods (i.e., proxies for acquired capability for suicide) in combination with high levels of psychosocial risk. My

findings from study two are consistent with Joiner's assertion, therefore, that in order to end one's own life, an individual must have both the desire and ability to end their own life (Van Orden et al., 2008). Given that Joiner proposes one mechanism through which NSSI may increase an individual's acquired capacity for suicide is by decreasing his/her sensitivity to pain, in study three I tested whether individuals who engaged in NSSI report decreased sensitivity to pain relative to individuals who did not engage in NSSI. Notably, I found that only individuals who engaged in NSSI to self-punish tolerated pain longer than non-injurers. Taken together, my findings support Joiner's primary contention that NSSI may increase risk for suicidal behavior because NSSI is associated with both psychosocial risk (i.e., a marker of suicidal desire) and the ability to end one's own life. My findings also extend Joiner's theory by offering new insight into the mechanism through which NSSI may lead to increased tolerance for pain.

Recall that Joiner (2005) has suggested that NSSI may habituate individuals to pain over time, thereby increasing their ability to enact lethal self-injury (i.e., acquired capability for suicide). Joiner suggests this occurs through an opponent process, whereby the experience of pain during NSSI (i.e., primary response) decreases, while the affective gains of NSSI are strengthened (i.e., the opponent response). If an opponent process occurs when individuals engage in NSSI, it would be expected that individuals who engage in NSSI (regardless of their motivations) would similarly report greater pain tolerances than individuals who do not engage in NSSI. In study three, however, my results indicated that only individuals who engaged in NSSI to self-punish reported greater pain tolerances (and less aversion to pain), relative to a comparison group of individuals who did not engage in NSSI. Thus, although NSSI may indeed increase an

individual's ability to enact lethal self-injury, this may not be primarily driven through an opponent process response to pain. Instead, it may be that NSSI teaches individuals to tolerate pain through practice (e.g., because pain is important when regulating the need to self-punish), or influences individuals' cognitive appraisals of whether the pain may be tolerable, which in turn, enables them to endure pain longer. Importantly, the results of study three suggest motivational factors underlying NSSI should be incorporated into theory on the link between NSSI and suicidal behavior.

Limitations and Future Research Directions

Although my doctoral research adds to a limited body of research on the link between NSSI and suicidal behavior (see Hamza et al., 2012 for a review), my work is not without limitations. As was noted across the individual studies, all of my research was conducted using a sample of undergraduate students from a Canadian University. The extent to which these results are generalizable to younger and older populations, non-students, and clinical populations remains to be determined. Indeed, research consistently has shown that the link between NSSI and suicidal behavior is stronger among inpatient samples than community-based samples (Andover & Gibb, 2010; Klonsky et al., 2013). Therefore, the processes through which NSSI and suicidal behavior are associated may be different among clinical populations (e.g., more severe NSSI, more overlap with suicidal behavior). Indeed, some clinicians have suggested that all individuals who engage in NSSI should be considered high risk for suicidal behavior, regardless of whether the individual expresses suicidal intent, given the overlap between NSSI and suicidal behavior in clinical populations (Kapur, Cooper, O'Connor & Hawton, 2013).

In addition, although recent theory (Joiner, 2005, Van Orden et al. 2008) and longitudinal research suggest that NSSI is a risk factor for suicidal behavior (Asarnow et al., 2011; Prinstein et al., 2008; Whitlock et al., 2013), my studies did not specifically assess the direction of effects. Thus, it cannot be determined from my studies whether NSSI leads to increased suicidal risk, or vice versa. Moreover, although my research provides new insight into why NSSI and suicidal risk may be associated, only multi-wave longitudinal data (i.e., at least three waves) can be used to test mediational models. It is interesting to note that work from other labs has demonstrated that NSSI predicts acquired capability for suicide (a measure developed by Joiner and colleagues; Bender, Gordon, Bresin, & Joiner, 2011; Franklin, Hessel & Prinstein, 2011), and that acquired capability for suicide predicts suicidal behavior (Van Orden et al., 2008). No study has examined, however, whether acquired capability for suicide mediates the link between NSSI and suicidal behavior. Longitudinal research could specifically address this hypothesis.

It also is important to note that the intent of the individual engaging in self-injury was assessed by self-report measures in all of my doctoral studies. Self-report assessments are subject to response biases (e.g., recall errors, social desirability), and researchers have suggested it may be difficult for individuals to self-report on their intent during a given self-injury incident (i.e., potential for ambiguous intent; Kleespies et al., 2011; Maddock, Carter, Murrell, Lewin & Conrad, 2010). Although NSSI was assessed on the basis of non-lethal intent in my thesis, I did assess aggregate NSSI episodes. Future research, therefore, could specifically inquire about the intent of each individual self-injury episode, to better discern the individual's intent. Moreover, researchers are

beginning to employ other measures to assess intent (e.g., medical severity of act).

Identifying other methods to assess an individual's intent may be useful to supplement self-report research, but it is noteworthy that researchers have shown that using medical severity of an injury to assess intent may actually underestimate the individual's perceived lethality of intent (Brown, Comtois & Linehan, 2002; Kleespies et al., 2011). Thus, self-reported intent may be a more accurate predictor of future suicidal behavior (Brown et al., 2002).

Finally, given that both NSSI and suicidal behavior tend to have their onset in adolescence (Nock, 2010), studying NSSI and suicidal behaviors during this age period may be especially informative and important. Although my research specifically examined self-injurious behaviors among young adults, it would be useful to examine NSSI and suicidal behavior from time of onset (adolescence) into early adulthood (and beyond). Although research indicates that NSSI tends to have its onset earlier than suicidal behavior (Muehlenkamp & Guttierrez, 2007; Nock et al., 2008), it would be interesting to examine the time between the onset of NSSI and the onset of suicidal behavior among individuals engaging in both forms of self-injurious behavior. It also will be interesting for future research to examine whether an individual who engages in NSSI in adolescence remains at increased risk for suicidal behavior in adulthood.

Conclusions:

Recent empirical research suggests that NSSI is a robust predictor of suicidal behavior (see Hamza et al., 2012 for a review), and that individuals who engage in NSSI are at increased risk for suicidal behavior as compared to individuals without a history of NSSI (Andover & Gibb, 2010; Klonsky et al., 2013; Whitlock & Knox, 2007; Whitlock

et al., 2013). Despite recent findings, however, little is known about the processes through which NSSI may lead to increased suicidal risk. To address this significant gap in the literature, my doctoral thesis examined associations among psychosocial risk, NSSI, and several measures of suicidal risk (i.e., ideation, attempts, pain tolerance) among a large sample of young adults. In particular, I sought to identify individuals with a history of NSSI most at risk for suicidal behavior, in an effort to provide new insight into the processes through which psychosocial risk, NSSI, and suicidal behavior may be associated. Consistent with Joiner's (2005) theory, I found that engagement in NSSI was associated with both suicidal ideation and attempts, and that individuals most at risk for suicidal behavior were those who engaged in frequent NSSI, and experienced psychosocial risk. My work also extended Joiner's theory, by providing new insight into one factor (i.e., engaging in NSSI to self-punish) that may influence whether an individual develops acquired capability for suicide. Importantly, my doctoral findings provide clinicians and health-practitioners (particularly in a university-based setting) with several specific ways to discern suicidal risk among individuals in NSSI.

In particular, I identified several NSSI characteristics that could be used as basic starting guidelines from which clinicians may try to determine suicidal risk among individuals engaging in NSSI. For example, I found that frequency of NSSI engagement (as well as number of methods of NSSI) was associated with suicidal risk. More specifically, young adults who engaged in frequent NSSI (i.e., more than 10 lifetime incidents) were at greater suicidal risk than non-injuring controls, as well as individuals who engaged in NSSI infrequently (i.e., less than 10 lifetime incidents). Moreover, high-risk individuals reported engaging in 4-5 different methods of NSSI, whereas low-risk

individuals reported using 1-2 methods. Among those who engaged in frequent NSSI, involving multiple methods, individuals who met the clinically significant cutoff score for high suicidal risk also reported more psychosocial risk than individuals who did not meet the clinical cutoff score. Thus, my findings underscore that clinicians working with individuals who engage in NSSI should consider the extent to which an individual's NSSI may be associated with their ability to enact lethal self-injury (e.g., frequency of engagement, number of methods) as well as degree of psychosocial risk (as this may be an important marker of suicidal desire).

My findings also suggest that assessing motivations for engaging in NSSI may help clinicians to identify those individuals most at risk for suicidal behavior. In particular, it was found that individuals who self-injured alone were at greater suicidal risk than individuals who engaged in NSSI in the presence of peers. Self-injuring alone has been associated with intrapersonal motivations for engaging in NSSI (to regulate stress, negative affect; Glenn & Klonsky, 2009). Moreover, I also found that individuals who engaged in NSSI to regulate the need to self-punish (which also is an intrapersonal motivation) had greater pain tolerances than individuals who engaged in NSSI but not to regulate the need to self-punish. Importantly, tolerance to pain has been found to be a strong predictor of suicidal risk (Nock et al., 2006; St. Germain & Hooley, 2013). These findings suggest that individuals who engage in NSSI primarily for intrapersonal reasons, particularly self-punishment, may be especially important for clinical interventions to target.

In conclusion, NSSI and suicidal behavior are distinct, but related forms of self-injurious behaviors. My findings suggest that NSSI may increase suicidal risk because

NSSI is strongly associated with psychosocial risk and suicidal ideation, as well as the ability to enact lethal forms of self-injury (e.g., tolerance to pain, suicidal attempts).

Thus, it is important to consider and assess suicidal risk among individuals engaging in NSSI, to ensure proper clinical care and treatment are provided. Importantly, my findings suggest that engagement in NSSI over time, frequent NSSI (involving multiple methods), self-injuring alone, and engaging in NSSI to self-punish may be important markers of suicidal risk, and can be used by clinicians to try and better discern suicidal risk among young adults engaging in NSSI.

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APPENDIX A

Demographics

1. What is your birth date? _____ year _____ month _____ day
2. Are you male or female? ☐ Male ☐ Female
3. What is the highest level of education that your MOTHER/STEPMOTHER (female guardian) whom you have lived with the MOST has completed? (If more than one mother, answer for one of them or if you have no contact with your mother/stepmother or female guardian please skip to Question 4 below)
 - ☐ Did not finish high school
 - ☐ Finished high school
 - ☐ Some college, university, or apprenticeship program
 - ☐ Completed a college/apprenticeship diploma (e.g., electrician) and/or technical diploma (i.e., graphic design, hair dressing)
 - ☐ Completed a university undergraduate degree
 - ☐ Completed a professional degree (e.g., masters, PhD, medical doctor, lawyer)
 - ☐ Still going to school
 - ☐ Don't know
4. What is the highest level of education that your FATHER/STEPFATHER (male guardian) whom you have lived with the MOST has completed? (If more than one father, answer for one of them or if you have no contact with your father/stepmother or male guardian please skip)
 - ☐ Did not finish high school
 - ☐ Finished high school
 - ☐ Some college, university, or apprenticeship program
 - ☐ Completed a college/apprenticeship diploma (e.g., electrician) and/or technical diploma (i.e., graphic design, hair dressing)
 - ☐ Completed a university undergraduate degree
 - ☐ Completed a professional degree (e.g., masters, PhD, medical doctor, lawyer)
 - ☐ Still going to school
 - ☐ Don't know

APPENDIX B

Inventory of Statements about Self-Injury (ISAS)

1. Please estimate the number of times in your life that you have intentionally (i.e., on purpose) done each type of *non-suicidal* self-injury (i.e., without lethal/suicidal intent)

number of times
(e.g., 0, 10, 100, 500)
put 0 if never

- | | |
|---|-------|
| a) Cut yourself on purpose..... | _____ |
| b) Burned yourself on purpose..... | _____ |
| c) Hit yourself or banged your head on purpose? | _____ |
| d) Pulled your hair or pinched yourself on purpose? | _____ |
| e) Bit yourself on purpose? | _____ |
| f) Scratched yourself on purpose so severely that you started to bleed? | _____ |
| g) Prevented wounds from healing? | _____ |
| h) Stuck yourself with needles, on purpose? | _____ |
| i) Abused prescription medication? | _____ |
| j) Exercised an injury on purpose? | _____ |
| k) Rubbed your skin against a rough surface on purpose? | _____ |
| l) Other | _____ |

If you answered 1 or more times to any of the behaviors listed above, please answer the following questions. Otherwise skip to the next page...

2. If you feel that you have a main form of self-harm, please indicate the behavior that you consider to be your main form of self-harm: _____

4. Did you experience physical pain when you self-harmed? ☐ yes ☐ sometimes ☐ no

5. When you self-harmed, were you alone? ☐ yes ☐ sometimes ☐ no

6. Typically, how much time elapsed from the time you had the urge to self-harm until you acted on the urge?
☐ < 1 hour ☐ 1 - 3 hours ☐ 3 - 6 hours ☐ 6 - 12 hours ☐ 12 - 24 hours ☐ > 1 day

7. Do you or did you want to stop self-harming? ☐ yes ☐ sometimes ☐ no

8. Please identify the statements that are most relevant for you:

"When I self-harmed, I was...

- | | Not
Relevant | Somewhat
Relevant | Very
Relevant |
|---|-----------------|----------------------|------------------|
| a) Calming myself down |○..... |○..... |○..... |
| b) Creating a boundary between myself and others |○..... |○..... |○..... |
| c) Punishing myself |○..... |○..... |○..... |
| d) Causing pain so I will stop feeling numb |○..... |○..... |○..... |
| e) Letting others know the extent of my emotional pain |○..... |○..... |○..... |
| f) Creating a physical sign that I feel awful |○..... |○..... |○..... |
| g) Releasing emotional pressure that has built up inside of me |○..... |○..... |○..... |
| h) Demonstrating that I am separate from other people |○..... |○..... |○..... |
| i) Expressing anger towards myself for being worthless or stupid |○..... |○..... |○..... |
| j) Creating a physical injury that is easier to care for than my emotional distress |○..... |○..... |○..... |
| k) Trying to feel something (as opposed to nothing) even if it is physical pain |○..... |○..... |○..... |
| l) Fitting in with others |○..... |○..... |○..... |
| m) Seeking care or help from others |○..... |○..... |○..... |
| n) Proving to myself that my emotional pain is real |○..... |○..... |○..... |

- o) Reducing anxiety, frustration, anger, or other overwhelming emotions ☐ ☐ ☐
- p) Establishing a barrier between myself and others ☐ ☐ ☐
- q) Reacting to feeling unhappy with myself or disgusted with myself ☐ ☐ ☐
- r) Keeping a loved one from leaving or abandoning me ☐ ☐ ☐
- s) Signifying the emotional distress I'm experiencing ☐ ☐ ☐

****included on second year of survey only****

9. In the past 12 months, how often have you engaged in self-harm behaviors
☐ I have not self-harmed in the past year ☐ Rarely ☐ Sometimes ☐ Often

****included in study three only****

1. Please estimate the number of times in the PAST YEAR you have intentionally (i.e., on purpose) done each type of *non-suicidal* self-injury (i.e., without lethal/suicidal intent)

number of times
(e.g., 0, 10, 100, 500)
put 0 if never

- | | |
|---|-------|
| a) Cut yourself on purpose..... | _____ |
| b) Burned yourself on purpose..... | _____ |
| c) Hit yourself or banged your head on purpose? | _____ |
| d) Pulled your hair or pinched yourself on purpose? | _____ |
| e) Bit yourself on purpose? | _____ |
| f) Scratched yourself on purpose so severely that you started to bleed? | _____ |
| g) Prevented wounds from healing? | _____ |
| h) Stuck yourself with needles, on purpose? | _____ |
| i) Abused prescription medication? | _____ |
| j) Exercised an injury on purpose? | _____ |
| k) Rubbed your skin against a rough surface on purpose? | _____ |
| l) Other _____ | _____ |

APPENDIX C

Suicide Behaviors Questionnaire Revised (SBQR)

1. Have you ever thought about or attempted to kill yourself?

- ☐ Never
- ☐ It was just a brief passing thought
- ☐ I have had a plan at least once to kill myself but did not try to do it
- ☐ I have had a plan at least once to kill myself and really wanted to die
- ☐ I have attempted to kill myself, but did not want to die
- ☐ I have attempted to kill myself, and really hoped to die

2. How often have you thought about killing yourself in the past year?

- ☐ Never
- ☐ Rarely (1 time)
- ☐ Sometimes (2 times)
- ☐ Often (3-4 times)
- ☐ Very often (5 or more times)

3. Have you ever told someone that you were going to take your own life, or that you might do it (check only one):

- ☐ Never
- ☐ Yes, at one time, but did not really want to do it
- ☐ Yes, at one time, but I really wanted to do it
- ☐ Yes, more than once, but I did not want to do it
- ☐ Yes, more than once, and I really wanted to do it

4. How likely is it that you will attempt suicide someday? (check only one):

- ☐ Never
- ☐ No chance at all
- ☐ Rather unlikely
- ☐ Unlikely
- ☐ Likely
- ☐ Rather Likely
- ☐ Very Likely

APPENDIX D

Daily Hassles

	Almost never bothers me	Sometimes bothers me	Often bothers me
a) Not having enough time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b) Not having enough money	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c) My weight	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d) Too much school work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e) Not enough close friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f) Not enough time to talk with friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g) Too few dates	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h) How I look	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i) Problems with roommates	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
j) Problems with friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
k) Getting to class on time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
l) Problems with boyfriend/ girlfriend	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
m) Problems with my family	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
n) Being lonely	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
o) Others' opinions of me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
p) Taking tests/exams	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
q) Household chores	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
r) Trying to get good marks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
s) What I'm going to do after my undergrad degree is done	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
t) Thinking about where I'm going to live next year	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
u) Thinking about picking a major	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
v) Thinking about finding a summer job	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
w) Trying to manage both a job and school work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
x) Not being able to meet my deadlines for school work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
y) If living away from home, missing my family /friends/home	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

APPENDIX E

Depressive Symptoms

Fill in the answer that best describes how often you felt or behaved in the past two weeks:

	NONE OF THE TIME (LESS THAN 1 DAY)	RARELY (1-2 DAYS)	SOME OF THE TIME (3-5 DAYS)	OCCASIONA LLY (6-9 DAYS)	MOST OF THE TIME (10-14 DAYS)
a) I was happy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b) I did not feel like eating; my appetite was poor	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c) I felt like I could not stop feeling sad, even with help from my family and friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d) I felt that I was just as good as other people	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e) I had trouble keeping my mind on what I was doing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f) I felt depressed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g) I felt that everything I did was an extra effort	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h) I felt hopeful about the future	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i) I thought my life had been a failure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
j) I felt fearful	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
k) I was bothered by things that usually don't bother me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
l) I talked less than usual	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
m) I felt lonely	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
n) People were unfriendly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
o) I felt like doing nothing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
p) I has crying spells	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
q) I felt sad	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
r) I felt that people disliked me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
s) I enjoyed life	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

APPENDIX F

Self-Esteem

Fill in the answer that best describes the way you feel:

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
a) On the whole I am satisfied with my life	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b) I feel that I have a number of good qualities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c) I am able to do things as well as most people	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d) I feel I do not have much to be proud of	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e) I feel useless at times	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f) I feel that I am a person of worth, at least equal with others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g) I wish I could like myself more	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h) All in all, I tend to feel that I am a failure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i) At times I think I am no good at all	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
j) I take a positive attitude toward myself	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

APPENDIX G

Difficulties with Emotion Regulation (DERS)

Please indicate how often the following statements apply to you:

	Almost never	Sometimes	About half the time	Most of the time	Extremely
a) I am clear about my feelings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b) I pay attention to how I feel	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c) I experience my emotions as overwhelming and out of control	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d) I have no idea how I am feeling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e) I have difficulty making sense out of my feelings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f) I am attentive to my feelings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g) I know exactly how I am feeling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h) I care about what I am feeling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i) I am confused about how I am feeling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
j) When I am upset and stressed, I acknowledge my emotions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
k) When I am upset and stressed, I become angry with myself for feeling that way	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
l) When I am upset and stressed, I become embarrassed for feeling that way	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
m) When I am upset and stressed, I have difficulty getting work done	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
n) When I am upset and stressed, I become out of control	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
o) When I am upset and stressed, I believe that I will remain that way for a long time.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
p) When I am upset and stressed, I believe that I will end up feeling very depressed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
q) When I am upset and stressed, I believe my feelings are valid and important	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
r) When I am upset and stressed, I have difficulty focusing on other things	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
s) When I am upset and stressed, I feel out of control	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
t) When I am upset and stressed, I can still get things done	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
u) When I am upset and stressed, I feel ashamed with myself for feeling that way	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
v) When I am upset and stressed, I know I can find a way to eventually feel better	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
w) When I am upset and stressed, I feel like I am weak	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
x) When I am upset and stressed, I feel like I can remain in control of my behaviours.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
y) When I am upset and stressed, I feel guilty for feeling that way	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
z) When I am upset and stressed, I have difficulty concentrating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
aa) When I am upset and stressed, I have difficulty controlling my behaviours	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
bb) When I am upset and stressed, I believe there is nothing I can do to make myself feel better	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
cc) When I am upset and stressed, I become irritated with myself for feeling that way	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
dd) When I am upset and stressed, I start to feel very bad about myself	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ee) When I am upset and stressed, I believe that wallowing in it is all I can do	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ff) When I am upset and stressed, I lose control over my behaviour	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
gg) When I am upset and stressed, I have difficulty thinking about anything else	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
hh) When I am upset and stressed, I take time to figure out what I'm really feeling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ii) When I am upset and stressed, It takes me a long time to feel better	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
jj) When I am upset and stressed, my emotions feel overwhelming	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

APPENDIX H

Social Anxiety

Fill in the answer that best suits you:

	Almost never or never	Sometimes	Often	Almost always or always
a) I am quiet when I'm with a group of other people my age	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b) I only talk to other people my age that I know really well	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c) I feel that other people my age talk about me behind my back	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d) I worry about what other people my age think of me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e) I feel that other people my age are making fun of me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f) I'm afraid that other people my age will not like me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g) If I get into an argument with another person, I worry that he or she won't like me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h) I worry about being teased	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i) I feel shy with people my age that I don't know	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
k) I worry about doing something new in front of other people my age	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
l) I feel shy even with other people my age I know well	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
m) It's hard for me to ask other people my age to hang out with me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
n) I'm afraid to invite other people my age to my house because they might say no	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

APPENDIX I

Behavioral Inhibition

Fill in the circle that best describes you:

	Strongly disagree	Disagree	Agree	Strongly agree
a) I feel something is going to happen I usually get pretty worked up	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b) I worry about making mistakes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c) Criticism or scolding hurts me quite a bit	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d) I feel pretty worried or upset when I think or know somebody is angry at me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e) Even if something bad is about to happen to me, I rarely experience nervousness	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f) I feel worried when I think I have done poorly at something	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

APPENDIX J

Friendship Quality

Think about your friends and answering the following:

	Almost always or always	Often	Sometimes	Almost never or never
a) I like to get my friends' points of view on things I'm concerned about	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b) My friends can tell when I'm upset about something	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c) When we discuss things, my friends care about my point of view	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d) Talking over my problems with my friends makes me feel ashamed and foolish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e) I wish I had different friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f) My friends understand me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g) My friends accept me as I am	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h) My friends don't understand what I'm going through these days	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i) I feel alone or apart when I am with my friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
j) My friends listen to what I have to say	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
k) My friends are fairly easy to talk to	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
l) My friends are concerned about my well-being	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
m) I feel angry with my friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
n) I can count on my friends when I need to get something off my chest	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
o) I trust my friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
p) I get upset a lot more than my friends know about	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
q) It seems as if my friends are irritated with me for no reason	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
r) I tell my friends about my problems and troubles	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

APPENDIX K

Mother Relationship Quality

Think about your mother and answering the following:

	Almost always or always	Often	Sometimes	Almost never or never
a) I like to get my mother's points of view on things I'm concerned about	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b) My mother can tell when I'm upset about something	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c) When we discuss things, my mother cares about my point of view	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d) Talking over my problems with my mother makes me feel ashamed and foolish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e) My mother understands me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f) My mother accepts me as I am	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g) My mother doesn't understand what I'm going through these days	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h) My mother trusts my judgment.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i) My mother expects too much from me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
j) My mother has her own problems, so I don't bother her with mine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
k) I get upset easily around my mother	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
l) I feel angry with my mother	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
m) I can count on my mother when I need to get something off my chest	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
n) I trust my mother	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
o) I get upset a lot more than my mother knows about	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
p) I don't get much attention from my mother	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
q) I tell my mother about my problems and troubles	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

APPENDIX L

Father Relationship Quality

Think about your father and answering the following:

	Almost always or always	Often	Sometimes	Almost never or never
a) I like to get my father's points of view on things I'm concerned about	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b) My father can tell when I'm upset about something	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c) When we discuss things, my father cares about my point of view	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d) Talking over my problems with my father makes me feel ashamed and foolish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e) My father understands me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f) My father accepts me as I am	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g) My father doesn't understand what I'm going through these days	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h) My father trusts my judgment.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i) My father expects too much from me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
j) My father has her own problems, so I don't bother her with mine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
k) I get upset easily around my father	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
l) I feel angry with my father	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
m) I can count on my father when I need to get something off my chest	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
n) I trust my father	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
o) I get upset a lot more than my father knows about	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
p) I don't get much attention from my father	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
q) I tell my father about my problems and troubles	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Appendix M

Mother Psychological Control

My mother is a person who...

	Not at all like her	Somewhat like her	A lot like her
a) Changes the subject whenever I have something to say	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b) Finishes my sentences whenever I talk	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c) Often interrupts me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d) Acts like she knows what I'm thinking or feeling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e) Would like to be able to tell me how to feel or think about things all the time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f) Is always trying to change how I feel or think about things	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g) Blames me for my other family members' problems	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h) Brings up my past mistakes when she criticizes me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Appendix N

Father Psychological Control

My father is a person who...

	Not at all like her	Somewhat like her	A lot like her
a) Changes the subject whenever I have something to say	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b) Finishes my sentences whenever I talk	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c) Often interrupts me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d) Acts like he knows what I'm thinking or feeling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e) Would like to be able to tell me how to feel or think about things all the time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f) Is always trying to change how I feel or think about things	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g) Blames me for my other family members' problems	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h) Brings up my past mistakes when he criticizes me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

APPENDIX O

Parental Criticism

Think about the following...

	Strongly disagree	Disagree	Agree	Strongly agree
a) My parents never try to understand my mistakes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b) I never feel like I can meet my parents' expectations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c) I never feel like I can meet my parents' standards	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

APPENDIX P

Delinquency

In the last 12 months, how often have you done the following?

	Never	Once	A few times	More than 5 times
a) Stolen money from parents/roommates	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b) Stolen something from a store (shoplifted)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c) Destroyed other people's property (i.e., vandalisms, graffiti, smashed mailbox, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d) Operated a vehicle while impaired (buzzed, drunk, high)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e) Been the passenger in a vehicle with a driver who was impaired	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

APPENDIX Q

Alcohol use

1) How often do you go drinking or have a drink?

- ☐ Never
- ☐ less than once a month
- ☐ 1-3 times a month
- ☐ Once a week
- ☐ 2 times a week
- ☐ 3-4 times a week
- ☐ 5-6 times a week
- ☐ Every day

2) On average, when you are drinking alcohol, how many drinks do you have?

- ☐ Less than 1 drink
- ☐ 1 drink
- ☐ 2-3 drinks
- ☐ 4-6 drinks
- ☐ 7-10 drinks
- ☐ Over 10 drinks

APPENDIX R

Emotional Reactivity

Please rate the following statements:

	Not at all like me	A little like me	Somewhat like me	A lot like me	Completely like me
a) When something happens that upsets me, it's all I can think about it for a long time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b) My feelings get hurt easily	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c) When I experience emotions, I feel them very strongly/intensely	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d) I tend to get very emotional very easily	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e) When I feel emotional, its hard for me to imagine feeling any other way	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f) If I have a disagreement with someone, it takes a long time for me to get over it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g) When I am angry/upset, it takes me much longer than most people to calm down	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h) I get angry at people very easily	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i) I am often bothered by things that other people don't react to	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
j) When something bad happens, my mood changes very quickly. People tell me I have a very short fuse	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
k) People tell me that my emotions are often too intense for the situation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
l) I often get so upset it's hard for me to think straight	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
m) Other people tell me I'm overreacting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

APPENDIX S

Painful and Provocative Life Events (PPE)

Please indicate how often the following events apply to you:

	Never	Once	2-3 Times	4-20 Times	More than 20 times
a) Have you gone skydiving?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b) Have you gone rock-climbing?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c) Have you participated in contact sports (e.g. tackle football, hockey, wrestling, judo)?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d) Did you get a tattoo?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e) Did you get a piercing?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f) Have you been a victim of physical abuse?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g) Have you been a victim of sexual abuse?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h) Have you been a witness to physical abuse?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i) Have you been a witness to sexual abuse?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
j) Have you gone on a motorcycle?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
k) Have you shot a gun?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
l) Have you tied a noose?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
m) Have you had surgery?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
n) Have you used intravenous drugs?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
o) Have you broken a bone?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
p) Have you intentionally hurt animals?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
q) Have you dissected animals?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
r) Have you gone bungee jumping?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
s) Have you been in a car accident?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
t) Have you ever had contact with the police because of criminal behavior?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
u) Have you ever been in physical fights?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
v) Have you ever jumped from high places? (e.g. Cliffs, roofs, balconies)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
w) Have you ever had any injuries requiring medical attention?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
x) Have you been stabbed?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
y) Have you been shot?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Self-Criticism

[illegible]

APPENDIX U

Participant Consent Form for Survey

Consent Form**Project Title: Stressed @ Brock?**

Principal Investigator: Teena Willoughby (Professor)
Department of Psychology, Brock University
Email: twilloug@brocku.ca; Phone: 905-688-5550, ext 5474

INVITATION.

You are invited to participate in a study that involves research. The purpose of this study is to explore stress, coping, and academic achievement in undergraduate students. We are interested in looking at factors that both contribute to and reduce stress, as well as promote academic success during the transition to university. We are particularly interested in what happens over time, as students go through university.

WHAT'S INVOLVED

As a participant, you will be fill out a survey assessing aspects of your university experience that create and reduce stress, as well as questions that assess mental health, such as academic pressures, depression, anxiety, suicide ideation, self-harming behaviors, spirituality, personality, and coping. Participation will take approximately 60 minutes of your time. In addition to completing the questionnaire, your participation also involves giving your consent to allow the researchers to compare your responses with your academic records at Brock (university and high school course selection and grades, course withdrawals, and a yes or no to whether there have been any suspensions). Records will be accessed annually throughout undergraduate studies, at the end of each winter term each year you are registered at Brock

POTENTIAL BENEFITS AND RISKS

Benefits of participation include either (a) the payment of \$10 or (b) proof of one hour research participation for credit in any one course that offers such credit, as well as the experience of taking part in psychological research. You will also get the opportunity to reflect on your life and your experiences in a confidential manner. The only anticipated risks associated with participation in this study is that some of the questions focus on negative aspects of yourself or negative events in your life, which may result in some discomfort. There is some loss of privacy that your grades and course selections will be accessed by the researchers, but please be assured that these data are used for research purposes only and will be kept entirely confidential.

Please indicate your choice between (a) payment and (b) proof of one hour research participation for course credit by checking ONE of the two spaces below:

☐ **I wish to receive \$10 for participation** **OR**
☐ **I wish to use this form for one hour course research participation credit**

CONFIDENTIALITY

All information you provide is considered confidential. Because our interest is in the average responses of the entire group of participants, neither you nor your responses will be identified individually in any way in written reports of this research. Group data only may be published, presented at conferences, used to evaluate programs, or used for secondary data analyses by other researchers. Data collected during this study will be stored in a secure location in Teena Willoughby's office in Plaza 519. Your name will not be kept in the same data file with your questionnaire responses; instead, your name will be kept in a separate file that will be available only to Dr. Teena Willoughby. The student investigators involved in data collection/analyses will only access the unidentifiable data; they will not be able to identify your responses. Note that your responses will NOT be made available to Brock University itself, so there will be no university record of your responses.

VOLUNTARY PARTICIPATION

Participation in this study is voluntary. If you wish, you may decline to answer any questions or participate in any component of the study. Further, you may decide to withdraw from this study at any time without any penalty or loss of benefits to which you are entitled. If at some future date, you decide to withdraw your permission for the researchers to obtain access to your academic records, you may do so by contacting the researchers, without losing your payment or proof of participation. Because we are interested in what happens to students as they go through university, you will be contacted via email (using the email address you provided on this consent form or when you signed up for the study) in the future with opportunities to participate in follow-up studies, but your participation in those studies is completely voluntary.

PUBLICATION OF RESULTS

Results of this study may be published in professional journals and presented at conferences. We will also email you with a summary of the results from this study by August 2009.

CONTACT INFORMATION AND ETHICS CLEARANCE

If you have any questions about this study or require further information, please contact Dr. Teena Willoughby, Faculty Supervisor, using the contact information provided above. This study has been reviewed and received ethics clearance through the Research Ethics Board at Brock University (file 09-118). If you have any comments or concerns about your rights as a research participant, please contact the Research Ethics Office at (905) 688-5550 Ext. 3035, reb@brocku.ca. Thank you for your assistance in this project. Please keep a copy of this form for your records.

Name (printed): _____

Email address: _____

Student number: _____

Signature: _____

Date: _____

APPENDIX V

Participant Consent for Lab Component

PROJECT TITLE: Stressed @ Brock: The Lab Component

Principal Investigator: Teena Willoughby (Professor)

Department of Psychology, Brock University

Email: twilloug@brocku.ca; Phone: 905-688-5550, ext 5474

Principal Investigator: Chloe Hamza, MA, Ph.D. Candidate

Department of Psychology, Brock University

Email: ch08za@brocku.ca; Phone: 905-688-5550, ext 5468

INVITATION:

You are invited to participate in a study that involves research. The purpose of Stressed @ Brock is to explore stress, coping, and academic achievement in undergraduate students. We are interested in looking at factors that both contribute to and reduce stress, as well as promote academic success during the transition to university. We are particularly interested in what happens over time, as students go through university. As part of Stressed @ Brock, you are invited to participate in a follow up lab based study on life events, stress, personality and emotions. You can participate in the study if you are 18 or older and do not have Raynaud's Syndrome (extreme whitening and severe pain in the hands even with mild cold).

WHAT'S INVOLVED

As a participant, you may be equipped with a heart rate monitor (by attaching 7 electrodes to your torso) to measure heart rate by the experimenter. You will then be asked to participate in a speaking exercise, which will be recorded. You will also be asked to place your hand in very cold water, which may be slightly uncomfortable, but you may remove your hand from the water at any time. You will then be asked to complete a series of questionnaires, and complete one computer task. We will then relate these measures to the survey responses you provided in the Stressed @ Brock survey, to examine how certain life experiences interact with aspects of personality, emotions and coping. Participation will take approximately 60 minutes of your time. You will be given \$30 for participating in the study. Course credit will not be provided for participation.

POTENTIAL BENEFITS AND RISKS

Benefits of participation include the payment of \$30 as well as the experience of taking part in psychological research. You will also get the opportunity to reflect on your life and your experiences in a confidential manner. In terms of risk, you will be asked to place your hand in very cold water which cause some discomfort. If you do not wish to put your hand in cold water, or the water becomes too cold to continue, you may stop participating at any time. There are no known risks associated with the use of hand immersion into cold water for only 2 minutes, and there is no danger of cold-injury (e.g., frostbite) with this study. You will also be asked some questions that may focus on negative aspects of yourself or negative events in your life, which may result in some discomfort but please be assured that these data are used for research purposes only and will be kept entirely confidential. You will also be asked to perform a speaking task, which will be recorded and may make you feel slightly uncomfortable. Again, you

may withdraw from the study anytime. If you do not want the experimenter to put the electrodes on you, you can apply them yourself or chose not to wear them.

CONFIDENTIALITY

All information you provide is considered confidential. Because our interest is in the average responses of the entire group of participants, neither you nor your responses will be identified individually in any way in written reports of this research. Data collected during this study will be stored in a secure location in Teena Willoughby's office in Plaza 519. Your name will not be kept in the same data file with your computer and questionnaire responses; instead, your name will be kept in a separate file that will be available only to Dr. Teena Willoughby. The student investigators involved in data collection/analyses will only access the unidentifiable data; they will not be able to identify your responses. Note that your responses will NOT be made available to Brock University itself, so there will be no university record of your responses.

VOLUNTARY PARTICIPATION

Participation in this study is voluntary. If you wish, you may decline to answer any questions or participate in any component of the study. Further, you may decide to withdraw from this study at any time without any penalty or loss of benefits to which you are entitled. Because we are interested in what happens to students as they go through university, you will be contacted via email (using the email address you provided on this consent form or when you signed up for the study) in the future with opportunities to participate in follow-up studies, but your participation in those studies is completely voluntary.

PUBLICATION OF RESULTS

Results of this study may be published in professional journals and presented at conferences. Group data only may be published, presented at conferences, used to evaluate programs, or used for secondary data analyses by other researchers.

CONTACT INFORMATION AND ETHICS CLEARANCE

If you have any questions about this study or require further information, please contact Dr. Teena Willoughby, Faculty Supervisor, using the contact information provided above. The Brock University Social Sciences Research Ethics Board has reviewed the above named research proposal and considers the procedures, as described by the applicant, to conform to the University's ethical standards and the Tri-Council Policy Statement (REB12-148). If you have any comments or concerns about your rights as a research participant, please contact the Research Ethics Office at (905) 688-5550 Ext. 3035, reb@brocku.ca. Thank you for your assistance in this project. Please keep a copy of this form for your records.

CONSENT FORM:

I confirm that I do NOT have Raynaud's Syndrome (extreme whitening of the hands and severe pain in the hands even with mild cold) and/or Cold Urticaria (allergy to cold), and understand that I will not be able to participate in the study if I have Raynaud's Syndrome and/or Cold Urticaria.

Name (printed): _____ Email address: _____
Date: _____ Signature: _____

APPENDIX W

Ethics Approval for Survey



Brock University
Research Ethics Office
Tel: 905-688-6660 ext. 3036
Email: reb@brocku.ca

Social Science Research Ethics Board

Certificate of Ethics Clearance for Human Participant Research

DATE: February 3, 2012
PRINCIPAL INVESTIGATOR: WILLOUGHBY, Teena - Psychology
FILE: 09-118 - WILLOUGHBY
TYPE: Faculty Research STUDENT: Teena Willoughby
SUPERVISOR: Teena Willoughby
TITLE: Stressed @ Brock?

ETHICS CLEARANCE GRANTED

Type of Clearance: MODIFICATION Expiry Date: 1/31/2013

The Brock University Social Sciences Research Ethics Board has reviewed the above named research proposal and considers the procedures, as described by the applicant, to conform to the University's ethical standards and the Tri-Council Policy Statement. Clearance granted from 2/3/2012 to 1/31/2013.

The Tri-Council Policy Statement requires that ongoing research be monitored by, at a minimum, an annual report. Should your project extend beyond the expiry date, you are required to submit a Renewal form before 1/31/2013. Continued clearance is contingent on timely submission of reports.

To comply with the Tri-Council Policy Statement, you must also submit a final report upon completion of your project. All report forms can be found on the Research Ethics web page at <http://www.brocku.ca/research/policies-and-forms/research-forms>.

In addition, throughout your research, you must report promptly to the REB:

- a) Changes increasing the risk to the participant(s) and/or affecting significantly the conduct of the study;
- b) All adverse and/or unanticipated experiences or events that may have real or potential unfavourable implications for participants;
- c) New information that may adversely affect the safety of the participants or the conduct of the study;
- d) Any changes in your source of funding or new funding to a previously unfunded project.

We wish you success with your research.

Approved:

Jan Frijters, Chair
Social Sciences Research Ethics Board

Note: Brock University is accountable for the research carried out in its own jurisdiction or under its auspices and may refuse certain research even though the REB has found it ethically acceptable.

If research participants are in the care of a health facility, at a school, or other institution or community organization, it is the responsibility of the Principal Investigator to ensure that the ethical guidelines and clearance of those facilities or institutions are obtained and filed with the REB prior to the initiation of research at that site.

APPENDIX X

ETHICS APPROVAL FOR EXPERIMENT



Brock University
 Research Ethics Office
 Tel: 905-688-5550 ext. 3035
 Email: reb@brocku.ca

Social Science Research Ethics Board

Certificate of Ethics Clearance for Human Participant Research

DATE: 1/21/2013
 PRINCIPAL INVESTIGATOR: WILLOUGHBY, Teena
 Psychology
 FILE: 12-148 - WILLOUGHBY
 TYPE: Faculty Research STUDENT: Chloe Hamza
 SUPERVISOR: Teena Willoughby
 TITLE: Stressed @ Brock: The lab component

ETHICS CLEARANCE GRANTED

Type of Clearance: NEW Expiry Date: 1/31/2014

The Brock University Social Sciences Research Ethics Board has reviewed the above named research proposal and considers the procedures, as described by the applicant, to conform to the University's ethical standards and the Tri-Council Policy Statement. Clearance granted from 1/21/2013 to 1/31/2014.

The Tri-Council Policy Statement requires that ongoing research be monitored by, at a minimum, an annual report. Should your project extend beyond the expiry date, you are required to submit a Renewal form before 1/31/2014. Continued clearance is contingent on timely submission of reports.

To comply with the Tri-Council Policy Statement, you must also submit a final report upon completion of your project. All report forms can be found on the Research Ethics web page at <http://www.brocku.ca/research/policies-and-forms/research-forms>.

In addition, throughout your research, you must report promptly to the REB:

- a) Changes increasing the risk to the participant(s) and/or affecting significantly the conduct of the study;
- b) All adverse and/or unanticipated experiences or events that may have real or potential unfavourable implications for participants;
- c) New information that may adversely affect the safety of the participants or the conduct of the study;
- d) Any changes in your source of funding or new funding to a previously unfunded project.

We wish you success with your research.

Approved:

 Jan Frijters, Chair
 Social Sciences Research Ethics Board

Note: Brock University is accountable for the research carried out in its own jurisdiction or under its auspices and may refuse certain research even though the REB has found it ethically acceptable.

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